Chemical Lib.

VOL. 14. NO. 7 Registered in U. S. Patent Office JULY, 1916

JUL 17 1916
UNIV. OF MICH. LIBRARY

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW.
$1.00 Per Year 99 JOHN STREET, NEW YORK 10 Cents Per Copy
A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES

BRASS ROD
CONTINUOUS CASTING CORPORATION
SALES OFFICES: 256 BROADWAY, NEW YORK
PLANT—GARWOOD, N. J.

Contents, Page 300 Directories, Page 48 Want Ads, Page 59 Index to Advertisements, Page 69

PARTICULARLY AT THIS TIME

A copy of that splendid treatise, "Crucibles—Their Care and Use," will be valuable to you. It has forty pages of interesting facts culled from EIGHTY-NINE years' experience in Crucible making.

It will pay you to send for "Crucibles—Their Care and Use." Ask for it by No. 12-A.

JOSEPH DIXON CRUCIBLE COMPANY
JERSEY CITY N. Y.
Established 1827

A46

THE STANDARD IN CRUCIBLES

MANUFACTURED FOR OVER 50 YEARS

J. H. GAUTIER & CO., JERSEY CITY, N. J.

THE better your crucibles, the lower your expense. The best is the cheapest. The best crucibles are McCullough-Dalzell's—known for 40 years. Order them—you'll never order any other make. Write for prices.

McCullough - Dalzell Crucible Co.
PITTSBURGH, PA.

USE ONLY THE CHAS. K. SCHWEIZER CO.
MOULDS
Waterback and Plain
214 Vine St.,
ST. LOUIS, MO.

SOLDER, BABBITT, LINOTYPE, TIN AND LEAD MOULDS.

Send your inquiries on special designs.

NOTICE TURKEY BOXWOOD SAWDUST and Other Kinds for Silver and Nickel Platers and Brass Goods Manufacturers
JOHN SOMMER FAUCET CO., 355 Central Ave., Newark, N. J.

PHOSPHORUS
For Phosphor-Bronze, Copper, Tin, Etc.
GENERAL CHEMICAL CO. 712 Lafayette Building PHILADELPHIA, PA.

KALYE
(Trade Mark)

FOR PREPARING METAL SURFACES FOR PLATING, &c.
SAMPLE CAN SENT FREE

Correspondence Solicited Mention this Journal

H. M. ANTHONY CO., Agent, 261 Greenwich St., New York

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED

THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:

ELECTRO-PLATERS REVIEW.

OLD SERIES Vol. 22. No. 7. | NEW YORK, JULY, 1916. | NEW SERIES Vol. 14. No. 7.

AMERICAN ELECTRO-PLATERS' CONVENTION.

AN ACCOUNT OF THE FOURTH ANNUAL MEETING OF THE AMERICAN ELECTRO-PLATERS' SOCIETY HELD IN CLEVELAND, OHIO, JULY 6, 7, 8, 1916, THE INTRODUCTION TO THIS ARTICLE HAS BEEN PREPARED FOR THE METAL INDUSTRY BY H. H. WILLIAMS, THE NEW PRESIDENT OF THE SOCIETY.

INTRODUCTION
BY H. H. WILLIAMS.

The fondest hopes of the members of the A. E. S. were realized in the assembling together of the delegates and visitors to the fourth annual convention at Cleveland, Ohio, July 6, 7, and 8, 1916.

The arrangements as made by the Cleveland branch have been commented upon most favorably by the whole gathering. From the beginning the usual handshake was not as formal and the calling of each by name was more frequent than on previous occasions, and many of the members felt well enough acquainted to bring their wives.

The welcome as extended by the Director of Public Welfare of the city, contrary to usual custom, did not hand over the key of the city, for none was needed, but he assured the delegates of his willingness to use the key to let anyone out if circumstances required. The sessions from the beginning proved conclusively that we are continually drawing closer to the goal which was in the mind of our founder, C. H. Proctor, when he began his task of getting the formen-platers together.

H. H. WILLIAMS,
President.

The jovial self-introductions waved aside any formality that remained up to that time, and then we settled down to the program as outlined elsewhere in this article. During the sessions devoted to the reading and discussion of papers, a keener interest than at other conventions was noticeable and the efforts in this direction are a credit to our society in the dissemination of knowledge concerning our art.

In the business sessions the usual amount of desire to improve our constitution by amendments resulted in a complete revising of it, rewording some sections and adopting it as a whole to the satisfaction of the great majority.

The nomination and election of officers for 1916-1917 brought out well chosen remarks and the unanimous election of each man for the several offices.

WALTER FRAINE,
Secretary-Treasurer.

W. G. STRATTON,
1st Vice-President

O. E. SERVISS,
2d Vice-President.

H. J. RICHARDS,
Editor.

Possibly choosing the 1917 convention city was the greatest contest of the entire session.

The invitation on behalf of New York and Eastern branches was presented in a most able way by George B. Hogaboom; then the one from St. Louis which was a continued one from the two previous conventions, asking for the honor of entertaining the 1917 session was presented by C. F. Hatfield, of the St. Louis Convention Bureau, and from Detroit by Mr. Brockway. It was necessary to take two ballots before St. Louis was declared the winner.

The automobile trip through the several beautiful parks and boulevards impressed the visitors so much that all hope that Cleveland will be a "come back" later.

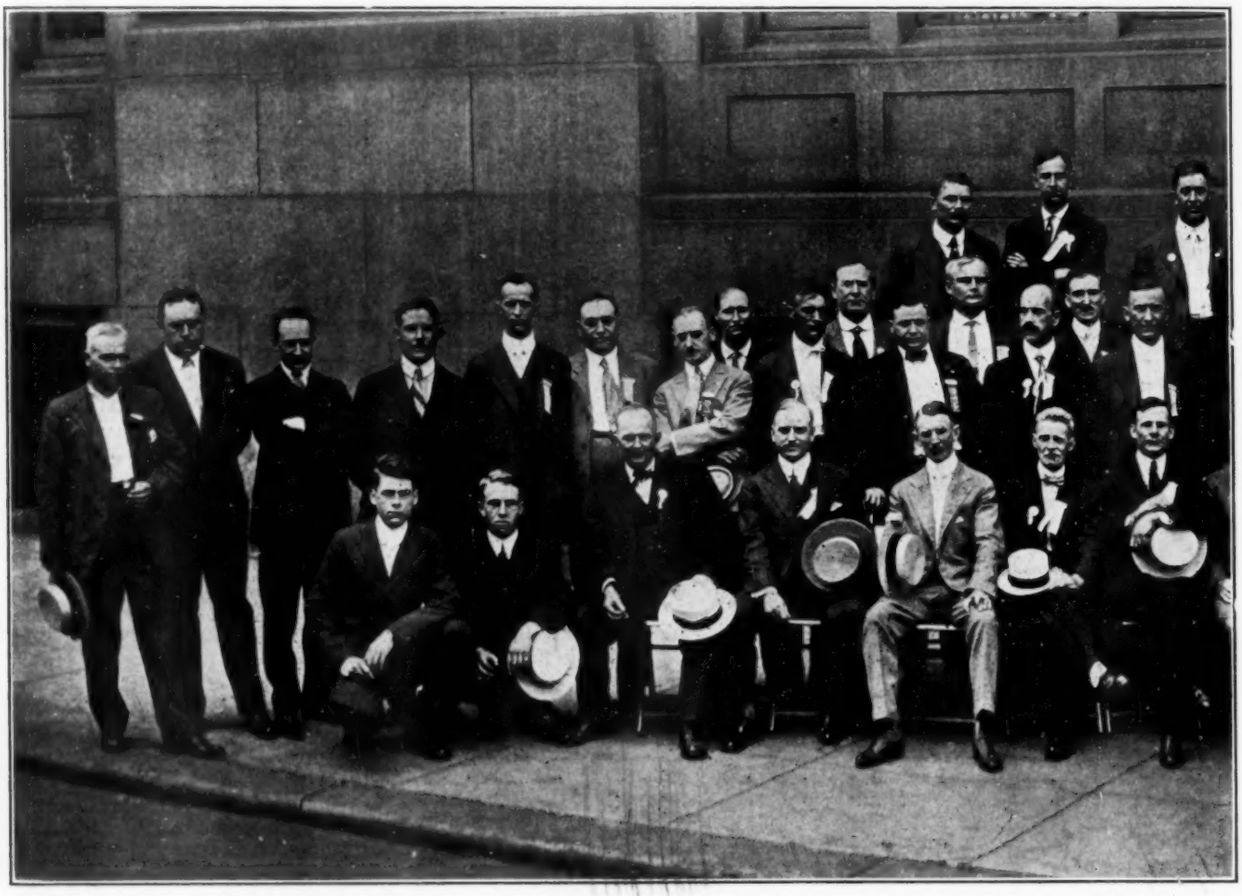
The banquet attended by the delegates and visitors, including many of the ladies, was a glorious finish to a well arranged, successful convention, for which we are under great obligation to the Cleveland branch and especially to its committee men, consisting of C. O. Werft and W. D. Scott.

The exhibit feature contained many interesting studies and much time was devoted to this room ("not booth or booze") by all in attendance.

We were glad so many ladies were present and invite them and others to St. Louis next year, when it is expected to show you just how the "Show Me" people of Missouri do things.

reading and discussion of papers. These were as follows: Anodes—F. J. Liscomb. This paper is published in full in this issue of THE METAL INDUSTRY. My Ideas for the Growth and Expansion of the A. E. S. Locally and Nationally, by C. W. Woodmansee; A Practical Zinc Cyanide Solution, by C. H. Proctor; Problems of the Job Shop, by Francis A. Shephard; Acid Copper Baths, by Dr. Blum, Bureau of Standards; Some Conditions in Plating Rooms and How They Can Be Avoided, by D. Allen Metz; the Laws Which Govern the Choice of an Electrolyte for the Deposition of Nickel, by The Philadelphia Branch; Something About Lacquers, by George I. Eddy.

Friday, July 7th, the second day of the convention was divided into three parts which consisted of business, pleasure and education. The business session in the morning resulted in the election of the new



PART ONE OF A PANORAMIC VIEW OF THE AMERICAN ELECTRO-PLATERS' SOCIETY ASSEMBLED IN CONVENTION AT CLEVELAND, OHIO, JULY 6-7-8, 1916.

The Cleveland convention with its good record is now history, live on in the future and come one and all to St. Louis in 1917.

THE CONVENTION.

The fourth annual convention opened Thursday July 7 according to the schedule published in THE METAL INDUSTRY for June, 1916, with the reading of the minutes of the convention held in Dayton, Ohio, in 1915. The minutes were approved as read and then the various reports of the supreme officers were read and accepted. Secretary Fraine reported that the Society now has a total membership of 618. The balance of the first day of the convention was devoted to the

officers for 1916-1917, after several amendments to the constitution had been adopted. The selection of the Convention City for 1917 also occupied the attention of the delegates for some time and after a spirited contest St. Louis, Mo. was the lucky city. The new officers, most of whose faces as here shown are well known to the readers of THE METAL INDUSTRY are as follows

H. H. Williams, St. Louis branch, Supreme president.

W. G. Stratton, Bridgeport branch, first vice-president.

Oscar E. Serviss, Chicago branch, second vice-president.

Walter Fraine, Dayton branch, secretary and Treasurer.

H. J. Richards, St. Louis branch, editor.

Friday afternoon was given over to pleasure and the delegates and visitors with their wives scattered at will to the many places of interest to be found in Cleveland and its environs. Friday night found the platers again in serious employment; that of reading and discussing more papers. These were as follows:

How to Make the Branch Societies of Greater Value and Interest to the Members, by Walter Fraine; The Trade Paper and the Plater, by D. F. C. Stauless; Bright Nickel Plating, by H. J. Ter Doest.

The last day of the convention, Saturday, July 8, was probably the busiest of the whole week. The morning was devoted to a shop visitation when the plants of the Standard Welding Company, Guide Motor Lamp Company, W. S. Tyler Company and the Cleveland Foundry Company were visited. At 2 p. m. an extensive automobile trip about Cleveland was indulged in and at 7 p. m. every one enjoyed a banquet at the Hotel Statler when the following papers were read:

Improving the Efficiency of Plating Room Circuits, by H. E. Willmore, Jr.; How Can the Distant Members be Benefited, by George B. Hogaboom; Looking Forward, by Herbert J. Hawkins; Then and Now, by E. S. Thompson.

For their efforts in making the Cleveland Convention the most notable in the history of the American Electro Platers Association, the thanks and praises of every one who participated are due to the members of the various convention committees. As is most always the case in a work of preparing for any large gathering, there will be noticed some individual members who make themselves conspicuous for their energy and enthusiasm and in reviewing the work of the committees, for the Cleveland Convention it is seen that there was no exception to the general rule and consequently H. J. Ter Doest, chairman, and C. O. Werft, secretary of the convention committee, R. H. Sliter, of the exhibit committee, are entitled to special mention and also Mrs. H. J. Ter Doest for her work in attending to the entertainment of the ladies. The work of the various committees of the convention was made somewhat harder than had been expected, due to the fact that although the Convention Board of the Chamber of Commerce of Cleveland, Ohio, had made many promises in reference to publicity and general arrangement, nothing finally was done by their body leaving the proposed work to fall upon the shoulders of the committees of the local branch.

PART TWO OF THE VIEW OF THE PLATERS AND THEIR FRIE NDS AT CLEVELAND, OHIO.

EXHIBITS AND EXHIBITORS.

As has been the custom at the various conventions of the A. E. P. S. there was quite an extensive exhibit made by manufacturers of and dealers in electro-plater's equipment and supplies. The list of exhibitors is as follows:

Crown Rheostat & Supply Company, Chicago, Ill.—Rheostats.
Roessler & Hasslacher Chemical Company, New York City.—Finishes produced by zinc cyanide.

John W. Masury & Son, Brooklyn, N. Y.—Literature on Resisto Coating.
Celluloid Zapon Company, New York City.—Various finishes produced by the use of Zapon lacquers.
Divine Bros., Utica, N. Y.—Buffs (sewed).
Connecticut Dynamo & Motor Company, Irvington, N. J.—Dynamos.
U. S. Electro Galvanizing Company, Brooklyn, N. Y.—U. S. Junior Plating barrel.
Dalton Adding Machine Company, Cincinnati, Ohio.—Adding machines.
De Vilbiss Manufacturing Company, Toledo, Ohio.—Aeron systems.
Taylor Instrument Companies, Rochester, N. Y.—Temperature controllers.
Boissier Electric Company, New York City.—Circular matter on dynamo and plating barrel.

EXHIBITS BY PLATERS.

In addition to the exhibits of platers' materials, there was also an extensive array of specimens of work showing the various kinds of finish that are produced in the plating shop and among these exhibitors were the following:

W. T. Wicks, Cleveland, Ohio.
H. J. Ter Doest, Akron, Ohio.
Robert G. Suman, Dayton, Ohio.
Walter Fraine, Dayton, Ohio.
H. H. Posbeck, Chicago, Ill.
F. E. Thompson, Indianapolis, Ind.
Geo. Bechtel, Indianapolis, Ind.
H. C. Warner, Indianapolis, Ind.
A. N. Theriault, So. Norwalk, Conn.
Edw. W. T. Faint, Roselle, N. J.

PART THREE OF THE VIEW SHOWN ON THE PRECEDING PAGE S. IF YOU HAVE NOT FOUND YOUR OWN OR YOUR FRIEND'S PICTURE BEFORE, YOU WILL FIND IT HERE OR ON THE NEXT PAGE.

Northern Blower Company, Cleveland, Ohio.—Exhaust systems.
Cleveland Tool & Supply Company, Cleveland, Ohio.—Complete equipment and supplies for plating and polishing.
Frederic B. Stevens, Detroit, Mich.—Supplies.
J. B. Ford Company, Wyandotte, Mich.—Wyandotte cleaner.
General Supply Company, Cleveland, Ohio.—Supplies.
Electro-Platers Supply Company, Cleveland, Ohio.—Equipment and supplies.
Ele-Kem Company, Chicago, Ill.—Plating barrel.
W. R. Parsons, Chicago, Ill.—Miniature of their barrel.
E. J. Woodison Company, Detroit, Mich.—Platers' supplies.

In addition to the above practically every supply house catering to the plating and polishing trades were represented by proprietors, managers and salesmen.

L. H. O'Donnell, Jersey City, N. J.
Music Plating Company, St. Louis, Mo.
John Corbit, Pittsburgh, Pa.
Cleveland Burial Case Company, Cleveland, Ohio.
Andrew Wetmore, Detroit, Mich.
H. H. Williams, J. F. McCarthy, G. Lamkemeyer, E. J. Musick, C. S. Weygandt, T. F. Carson, H. J. Richards, Harry Deubelbeis, all of St. Louis, Mo.

SOME OFFICIAL OPINIONS.

Charles H. Proctor, the founder: "The fourth annual convention of the American Electro-Platers' Society, held in Cleveland, was without a doubt one of the most successful that has been held by the society. The number of papers presented and the discussions held, and the many valuable points brought

out will prove of inestimable value to the members of the society. One of the conditions that a plater has to contend with, especially with cyanide plating, is cyanide poisoning. The mere mention that one of the delegates from Milwaukee was suffering from this terrible affliction, and was unable to attend, brought forth much sympathy. He made an appeal to the members of the society to take up the matter at the convention and discuss this most dreaded malady in an endeavor to find some method whereby it could be eliminated. Dr. Hollar, of the Bureau of Standards, was so much impressed with the discussions held upon this matter that it is his intention to bring the matter before the Government Health Bureau so that it can be taken up and some remedies prescribed to overcome this trouble. He went upon record in his remarks stating that in his opinion this was one of the best matters brought before the convention. Much credit is due to the Cleveland branch for the splendid efforts put forth and the splendid results obtained. The results that will accrue from the fourth annual convention in Cleveland will perhaps not be surpassed in any future convention, but as the society must continue to develop upon modern lines and modern developments, it is only hoped that that fifth annual convention, to be held in St. Louis in 1917 will even surpass the efforts put forth in the 1916 convention."

W. S. Barrows, past president: "The Cleveland convention was a decided success and a credit to the energetic members of the Cleveland branch. Progressiveness was the keynote, and the papers presented were of special value, and some were truly brilliant."

THE ATTENDANCE.

The number of delegates and visitors in attendance was most gratifying and is a fine testimonial to the steady and substantial growth of the Society. Fourteen cities sent from one to three delegates.

PART FOUR, AND LAST, OF THE ELECTRO-PLATERS' CONVEN TION AT CLEVELAND, OHIO, JULY 6-7-8, 1916.

INCREASED ACTIVITY IN MANGANESE MINES

There has been greatly increased activity among the manganese mines of the United States during the first six months of 1916. This activity is shown by the operation of new mines, the reopening of old mines and more regular production from the mines already active. There is a prospect that the production for the entire year, according to D. F. Hewett of the United States Geological Survey, will greatly exceed that for 1915, which was 9,651 tons, the largest since 1901.

Several discoveries have been reported from Arizona, California, Oregon, Utah, and Virginia, and there are new operators in Arkansas, California, New Mexico, Utah, and Virginia.

During the first quarter of 1916 the prices of all grades of manganese ore rose rapidly to the highest figures recorded in 30 years. Prices of 60 to 65 cents a unit for ore containing 45 to 50 per cent. of manganese and more than 1 per cent. of iron were freely offered about April 1, and it is reported that 70 cents a unit, or $35 a ton was paid for several lots. During the second quarter prices remained constant at these figures. Large quantities of Brazilian ore continue to be received.

NICKEL ANODES*

An Address Dealing With Methods for Testing Their Purity.

By Fred J. Liscomb.

We learn from the scholars that the word anode is derived from the Greek words "Ana," meaning "up" and "Ode" meaning "away." The word anode therefore means "up and away."

As we progress in the art of electroplating we soon discover that unless anodes are endowed with that "up and away" characteristic while hanging in the plating solution under the influence of the electric current, there is soon trouble with the solution.

In order that an anode may "up and away" then, it must have certain properties which render it soluble in all nickel plating solutions, or we must so change the solution that it will cause the metal to dissolve from the anode to reimburse the solution for the metal of which it has been divested at the cathode.

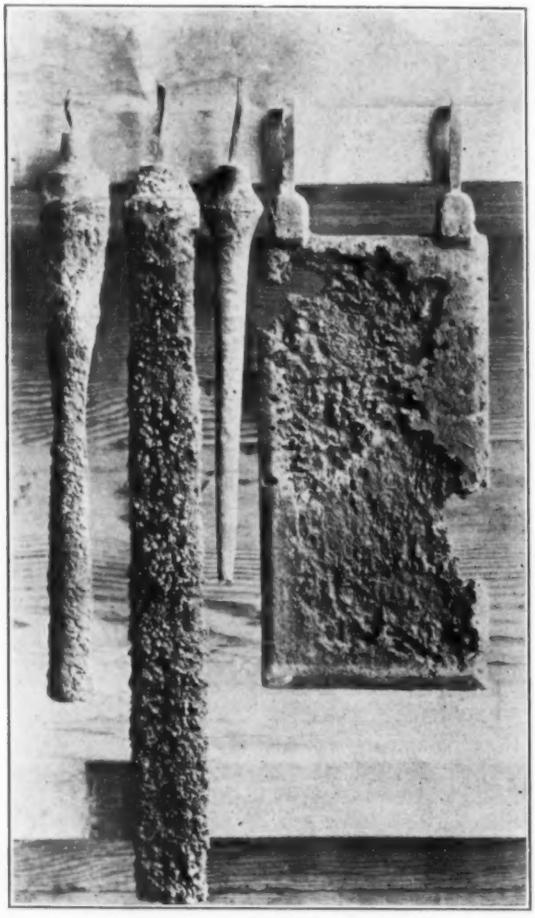


FIG. 1. SHOWS THREE HARD, ALMOST INSOLUBLE, NICKEL ANODES. THE SMALL ANODE IN THE CENTER SHOWS THE WHOLE SURFACE TO BE ACTIVE SURFACE.

If the anode is not freely soluble in the bath and therefore does not replace the metal withdrawn at the cathode, then we find that the bath soon becomes acid in proportion to the metal withdrawn. And unless we provide the bath with a neutralizing factor, as aqua ammonia or carbonate of nickel, the deposit soon indicates the presence of acid by becoming scanty and brittle.

In using 97-99 per cent. nickel anodes in a single salts solution, the addition of nickel carbonate is recommended as it regenerates nickel sulphate. Aqua ammonia is to be avoided as it causes the gradual formation of sulphate of ammonia. This, then, in turn combines with the single nickel salts to form double salts.

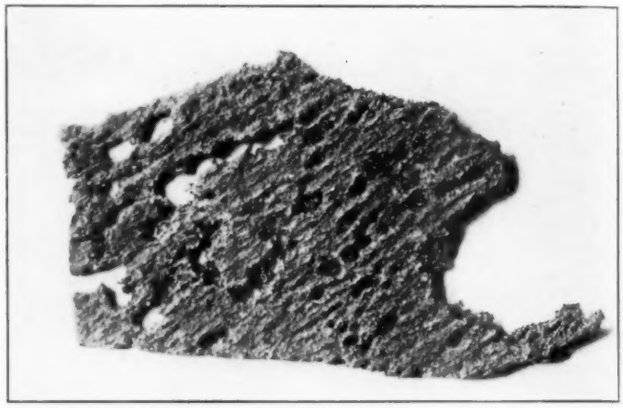


FIG. 2. SHOWS A PIECE OF ROLLED NICKEL WHICH HAS BEEN USED AS AN ANODE. NOTE THE PERFORATIONS SEEM TO RUN IN STRAIGHT LINES AS IF THE CORROSION HAD FOLLOWED GRAIN OR FIBRE.

If it is suspected that acid is being liberated while the bath is in action, a simple test can be made by placing a piece of blue litmus paper in contact with the anode under the surface of the solution. The blue paper will turn red if the anode is not dissolving freely with insoluble anodes the color of the paper changes very rapidly.

It might be said parenthetically that several of the enthusiastic advocates of pure anodes with a single salts solution are gradually working their solutions over into the old stand—by double salts solutions as they have found that the old solution is less liable to pit—all theoretical evidence to the contrary notwithstanding.

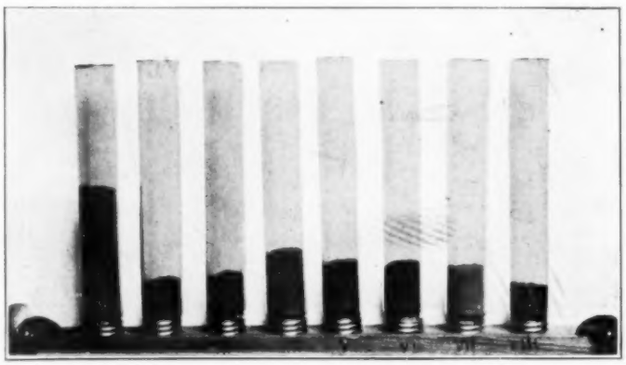


FIG. 3. SHOWS EIGHT SAMPLES OF SCALE CLEARED FROM EIGHT DIFFERENT ANODES, EACH VIAL CONTAINS FIVE GRAINS OF WASHED AND DRIED SCALE.

Some makes of nickel anodes are very soluble, while other makes are dissolved with difficulty even in sulphuric acid. The prospective purchaser of nickel anodes is frequently heard to remark, "Nickel is nickel;

*Paper read at American Electro-Platers' Convention held in Cleveland, Ohio, July 7-8-9, 1916.

they assay 90-92 per cent., therefore they must be good." So, too, "Pigs is pigs," but the hams of a guinea pig are not much in demand by the sandwich makers. But to get back to nickel anodes. While it may be true that the anodes do analyze 90-92 per cent., or any other percentage which may have been ordered, yet there is a difference between the anodes cast by one melter and those cast by another melter, just as there is a difference in the iron used in making castings. In the iron foundry they find that unless the iron has certain properties, and unless certain conditions prevail, the resulting castings are so hard that they cannot be drilled—or perhaps they shrink too much, or not enough.

So, too, with metallic nickel. Unless certain methods and conditions prevail, the resulting casting, or anode, would be more successful as a sash weight than as an anode for nickel plating. The ideal nickel anode should be soluble in any nickel solution, whether made from double or single salts. It should dissolve away, leaving no residue whatever, just as does a silver or gold or copper anode.

Inasmuch as nickel cannot be melted except at a very high temperature and never comes from the open fire as pure as it went in, it becomes necessary for the maker of anodes to provide a suitable means for reducing the metal to a fluid state and casting it with the least deterioration possible. This is done to the best of the melter's knowledge, many times with indifferent success. While the percentage of purity may be all that is claimed, the pictures show there is a difference in the physical structure of the several anodes photographed, as the surfaces of many of them are a mass of very hard nickel cystals. Some of the speciments have been in the solution and in constant use for several years without having been materially attacked.

One of the important things to be considered by the buyer of anodes is, how much of the anode does not go into the solution but is lost in the slime scraped from the anode while being cleaned from time to time?

This black scale, or slime, has been regarded as a necessary evil, and to a certain extent this is true since a slime forms on all makes of anodes. But there is a vast difference in the quantity of metal contained in the slime, or scale, taken from the different makes of anodes, there being no two of them even approximately the same. If the scale is heavy and the quantity large, it is a factor that must be considered and it behooves the consumer, then, to become acquainted with a method for testing scale for its metallic content.

An easy method is to scrape each make of anode separately, being careful that the scale from the different makes does not become mixed. Each sample should be washed several times in hot water, taking care to allow the fine particles to settle each time before decanting. When all salts and soluble matter have been dissolved out, the mass may be dried on a filter, or by any other suitable means. Each sample is then placed in a bottle and laid aside for future consideration. When all the samples have been treated in this manner, procure a number of 25-CC vials, preferably long and narrow. Then weigh off very accurately, say five grams of each sample, placing each in a separate vial which of course must be dry. Cork the vial and mark it with the name of the maker of the anode, or in any other way so that you will know which is which.

If directions have been correctly followed, the bulk in the several vials will differ with the specific gravity of the samples. Those samples that contain the most metallic nickel will appear to have the smallest bulk in the vial, while those lighter in metallic nickel will more nearly fill the bottle, as this scale is light and fluffy. Placing the bottles side by side, the height of the material in the vials will be along the line of the accompaning diagram. The contents of each vial weigh the same, yet the bulk varies considerably. This is due to the presence of metallic nickel in greater quanties in some than in others. The reason for this is because the anodes are not of the same solubility. Many only disintegrate, leaving small particles of metal in the carbon and carbides; these eventually fall to the bottom of the tank or are scraped away and lost.

The diagram was made from eight such samples, numbered from one to eight. The scale was taken from anodes in actual use in factories where much plating is done. No. 1 and No. 8 are from two makes of anodes used in the same tank and under the same working conditions. Hence you will understand that the difference is not due to a difference in the solution. All of the eight are from anodes that were said to be of 90-92 per cent. purity. The percentage of metal contained in the eight samples from which the diagram was made was from about 3 per cent. metal for No. 1 to quite 9 per cent. for No. 8. The figures were secured by an analysis.

A very good idea of the metallic content of the scale may be obtained roughly by a magnet. To do this,

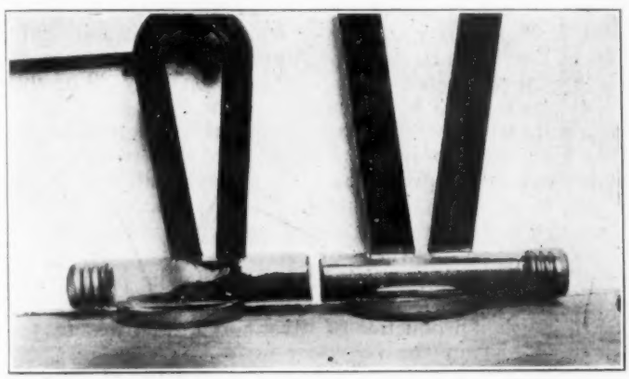


FIG. 4 SHOWS THE SCALE IN NO. 1 AND NO. 8 UNDER THE INFLUENCE OF A MAGNET. NO. 1 IS SHOWN AT THE LEFT HAND.

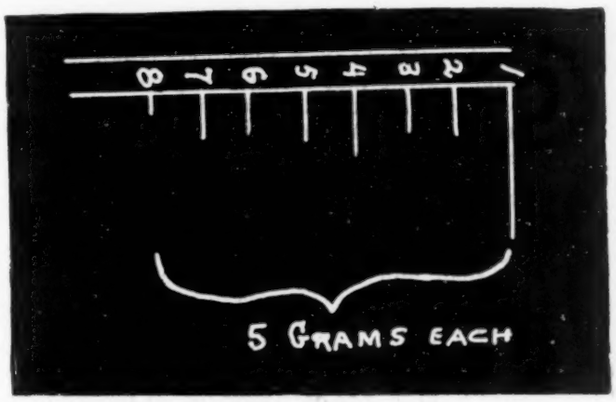


FIG. 5. DIAGRAM MADE FROM THE EIGHT BOTTLES.

take the vial containing the dried sample; hold it in a horizontal position with the scale in the bottom end. Now place a strong horseshoe magnet above the vial, the magnet to be in contact with the glass at the end where the powder is. Then slowly move the magnet toward the other end of the vial. If the powder is rich in metallic nickel a large mass of the contents of the vial will follow the magnet on the inside top surface of the vial, and will be in proportion to the metal present.

In No. 8 nearly the whole mass followed the magnet, while in No. 1 only a trace of metal followed the magnet. This test is only comparative, however, and gives no information as to the percentage contained. But if you have several makes of anodes in your tanks, you can by this test tell very quickly which anode is dissolving and more nearly feeding the solution, and in this way you can tell which anode is the most economical. The advantage of this test is that it costs little to try it out. In the diagram there is evidence that all anodes are not equally soluble. If then, in your test by this method you discover that the anodes in your tanks act like No. 8 they cannot be considered as first class, hence are not suitable for plating purposes and should be avoided.

If the anode is completely soluble, the solution remains unchanged so far as the metallic content is concerned—a very desirable condition, but it seldom prevails. On the other hand, if the anode is not corroded to the same extent that metal is deposited, the solution loses metal as stated above, and trouble follows unless some means is provided to neutralize the acid set free when the anode fails to furnish sufficient metal. With a perfectly soluble anode the only E. M. F. required is a quantity sufficient to overcome the electrical resistance of the solution.

As nickel anodes are never *perfectly* soluble, the E. M. F., then, will vary with their degree of solubility. The more nearly the anode in use in the solution approaches perfect solubility, the lower will be the counter E. M. F., or polarization factor. This counter E. M. F. can be measured easily on a voltmeter after the applied E. M. F. has been shut off. It will be found to vary from a small fraction to nearly one volt. If this counter E. M. F. is high, then we must increase the direct E. M. F. to just balance the counter current—otherwise the deposition will not proceed in a proper manner.

Burgess says that "The lower the current density at the anodes, the more nearly does the amount of metal corroded correspond with the electrochemical equivalent. With the commercial forms of this metal the current density must be kept below five amperes per square foot in order that a high current efficiency may be attained. This inturn requires that the anode should present as large an active surface as possible. This term active surface does not mean merely the area of surface which is exposed to the electrolyte, but rather the area which is exposed to the electrolyte from which the current flows. Since by far the greater portion of the current leaves the anode from the edge, it is manifest, then, that the most efficient anode is one of a shape that will permit the current to flow from the whole surface, thus making the whole surface active."

This idea was in mind when the elliptic anode was invented by one of our members, H. E. Starrett by name. The use of such an anode gives the maximum amount of active surface per foot length of tank. In a single salts solution it becomes an absolute necessity to have all the active surface possible, as with a small surface and high current density in the presence of sodium chloride, there is an opportunity for the formation of nickel hydroxide which is frequently mistaken for the well known iron precipitate found in all nickel solutions. If the anode be only partially soluble, it disintegrates instead of dissolving and the particles falling to the bottom of the tank are lost.

In at least one instance it was discovered that the slimes contained fifty per cent. of metallic nickel, fifteen per cent. of which was in the form of nickel hydroxide. This condition could be relieved by adding sulphuric acid were it not for the fact that the presence of even small quantities of this acid prevents the solution from working up to a high percentage of efficiency. But the relief would be only temporary, as the deposit would be scanty—perhaps entirely absent if the quantity of acid was large. It would, however, cause the anode to be more readily dissolved, besides dissolving any hydroxides of iron and nickel that might be present, until a point was reached where all the sulphuric acid had been converted into sulphates of nickel and iron, when the old condition would again prevail.

WHY SILVER IS HIGHER.

Thhe price of silver is higher at present than it has been before at any time since 1893. Not politics but the plain, old fashioned law of supply and demand has brought about the rise in this metal. A year ago silver was selling below 50 cents an ounce. The price on May 20 of this year was over 75 cents an ounce. The price has receded again, but the general range is markedly higher than it has been at any previous time for more than two decades. Only two years ago it took forty pieces of silver to buy a piece of gold of the same weight. At prices prevailing last month twenty-seven ounces of silver would buy an ounce of gold. Owners of producing silver mines naturally are reaping a rich harvest while the high prices prevail, except in Mexico.

Diminished production of silver and a greatly increased demand explain the notable rise in its price. A contributing cause of importance is the augmented demand for silver for coinage in the various European countries involved in war. The tendency in periods of serious unrest is for national governments and citizens alike to hoard gold, so that the great money metal practically disappears from circulation. To meet the need for an acceptable circulating medium silver is coined in larger quantities.

CONTINUED DEMAND FOR QUICKSILVER

The domestic quicksilver industry has continued active during the first six months of 1916, and the average price for the period has been about double the exceptionally high average for the entire year 1915. Figures just compiled by the United States Geological Survey show that the total production of quicksilver in the United States in 1915 was 21,033 flasks of 75 pounds each, having a marketed value of $1,826,912, or an average of $86.86 per flask. Of this output 14,283 flasks, selling for $1,174,881, came from California, and the remainder almost entirely from Texas and Nevada. The actual average sales value for the whole country exceeded the average market value in San Francisco—which was $85.80 for the year. In 1914 the domestic output was 16,548 flasks, valued at $811,680, and therefore the production for 1915 showed an increase of over 27 per cent. in quantity and 125 per cent. in value.

MAGNESIUM SULPHATE

Its Use in Nickel Plating Solutions.

Written for The Metal Industry

By D. W. Robinson, Foreman Plater Remington Typewriter Company, Ilion, N. Y.

From time to time in The Metal Industry and other trade journals, formulæ for nickel solutions containing magnesium sulphate have appeared. Its use so far as can be learned from the published statements has been and is now somewhat limited. It is the writer's purpose to give an account of his experience in using magnesium sulphate as a factor in producing a superior grade of nickel plating, not only in solutions for plating zinc and die castings, but also for the regular deposition every day of a high grade nickel upon steel, cast iron, brass, nickel silver, etc.

D. W. ROBINSON

Magnesium sulphate or Epsom salt is a white crystalline salt readily soluble in cold water or the ordinary nickel solution at normal temperature. It is an excellent conducting salt and enters into the combinations usually found in nickel solutions causing no disturbance but showing immediately a beneficial result both in the character of the deposited nickel and in the weight and thickness deposited in a given time, this being determined by the acid test as well as by micrometer test and comparison. The parts being plated under the same conditions as to number of pieces in the tank at one time in the solutions which contained no magnesium sulphate, the same constant voltages being maintained for the same length of time in each tank, the same number and square inches of surface of anode.

Upon examination of the anodes used in the tanks containing magnesium sulphate it was noticed that they presented a clean surface and a very even corrosion markedly different than those used in the tanks which contained no magnesium sulphate. Further experience has shown that solutions containing the magnesium sulphate in proper proportion keep up their metallic strength better than others, additions of nickel sulphate being very seldom required. Pitting is unknown. The writer is not prepared to say, however, that magnesium sulphate is a cure for pitting but it is a fact that in the solutions which contain this salt, pitting seldom if ever occurs and this in spite of the fact that it is possible to run these solutions at a much higher voltage than is commonly used with the ordinary double salt solution.

Another feature which is important is the rust resisting quality of the nickel deposit from the solutions which contain magnesium sulphate in proper proportion, it being found by tests often repeated that steel and iron plated in these solutions not only resist the action of strong acids longer but do not rust as quickly. This is especially true in comparing steel and iron parts nickel plated in the solutions containing sodium chloride or ammonium chloride as conducting salts, it being found that such parts were more readily attacked by the testing acid and also rusted more quickly when exposed to moist air, steam or ordinary atmospheric conditions. Deposited nickel on steel from solutions which contain boric acid in excess of 3 ounces per gallon, when subjected to the same tests, was found to be inferior to the deposits from the solutions containing magnesium sulphate.

The objection which the writer has seen made to the use of magnesium sulphate is that the deposit has a yellowish cast or tone. This may be true when the solution to which the magnesium sulphate is added is not rich enough in metal or acid, but where the metallic strength is kept up and also the acidity, this objection vanishes.

SOLUTIONS AND THEIR USE.

Now just a few words about solutions and how a properly balanced solution containing magnesium sulphate should be made. The writer finds that it depends upon what the class of work is and the requirements as to buffing, wear, exposure, rough handling, etc. A good working solution for all metals except zinc, die castings or alloys containing zinc and aluminum, is composed as follows:

Water	1	gallon
Nickel sulphate	4	ounces
Nickel ammonium sulphate	8	"
Magnesium sulphate	2 to 4	"

For die castings, zinc and aluminum alloys:

Water	1	gallon
Nickel sulphate	7	ounces
Magnesium sulphate	5½	"
Ammonium chloride	3½	"
Nickel ammonium sulphate	8	"

This solution to be made very slightly acid with sulphuric acid. This gives fine results on zinc and die castings previously flash coppered, a fine bright coat of nickel being deposited in from ten minutes to half an hour using from 2½ to 4 volts, with full load using anodes of 95-97 per cent. grade.

In a recent paper presented by Messrs. Mathers, Stuart and Sturdevant at the American Electrochemical Society meeting at Washington, D. C., great stress is laid upon the use of pure electrolytic anodes in nickel plating. The writer is a believer in the use of pure anodes but only because of the fact that fewer impurities are introduced into the bath. As it is practically impossible to obtain electrolytic nickel anodes at this time the next best anode to use is the cast anode of 95-97 per cent. purity.

The writer notes that one of the things advised is the use of ammonium citrate 0.2 to 0.3 per cent. "to keep the solution free from sludge," the statement being made that the iron impurity is taken up into the solution and deposited with the nickel. That, it would seem to the writer, would be all right if the metals upon which the nickel was to be plated were all in the non-ferrous class, but is it not better to deposit pure nickel? and especially upon iron and steel? Most platers, the writer believes will agree that nickel deposits upon iron and steel from solutions which contain much iron will rust quickly upon exposure. Would it not then be better to allow the "sludge" to fall to the bottom of the tank and occasionally remove it?

The writer has found by repeated tests that deposits of nickel from solutions which have become contam-

inated with iron either from the impure anodes or from other sources such as chips, filings, etc. readily rust. The same is true of the deposits obtained from most of the so-called "rapid" plating solutions which contain a large per cent of chlorides such as sodium chloride, ammonium chloride, magnesium chloride, etc. These salts certainly do greatly increase the conductivity of the nickel plating solution or, as one writer in speaking of the so-called rapid plating salts says, they "permit a rapid dissociation of the elements composing the nickel solution," which is true.

But what of the character of the deposited metal? Laughein says in his "Deposition of Metals," page 145.

"To decrease the resistance of the nickel solutions conducting salts are added to them which are also partially decomposed by the current. Like the use of nickel chloride in nickeling iron, an addition of ammonium chloride which is much liked cannot be recommended, though the subsequent easy reduction of nickel invites its employment."

He also makes this statement:

"For copper and its alloys, zinc, etc., the chlorine combinations may be used, but for nickeling iron and steel they must be avoided as the source of future evils."

Experience has shown that the plating from solutions which are made up with chlorides as conducting salts will assume a leaden color sooner than the plating from solutions which contain no chlorides. This is particularly true of buffed surfaces when exposed to ordinary atmospheric conditions. Such plating is hard to brighten up or clean after standing for a time without attention. Quite the contrary is true of the plating from solutions which contain magnesium sulphate. Polished and buffed articles stand up better and retain their lustre longer and are more readily cleaned and polished. The plating is actually whiter and buffs to a higher lustre with a little effort and there is no solution pitting with a properly balanced solution.

CONDUCTING SALTS.

Magnesium sulphate is the most reasonable salt to use as a conductor in nickel solutions and especially in solutions for plating iron and steel. It can be used in combination with boric acid or sulphuric acid in solution, either combination giving good results. However, when solutions are made with boric acid the best results are obtained when solutions are made strongly acid and so maintained.

A suitable and good working solution with both boric acid and magnesium sulphate for general work is made as follows:

Water	1	gallon
Nickel ammonium sulphate	10	ounces
Nickel sulphate	2	"
Boric Acid	4	"
Magnesium sulphate	4	"

or the single salt solution as follows:

Water	1	gallon
Nickle sulphate	14	ounces
Magnesium sulphate	4	"
Boracic Acid	4	"

If bright plating is desired the addition of a minute quantity of yellow dextrine to these solutions will give the desired result. Care should be taken not to add too much dextrine as an excess will cause the plating on the lower ends of pieces to curl up and flake off. However, when used with care beautiful bright deposits are obtained.

One ounce of yellow dextrine dissolved in one pint of hot water furnished the supply of "brightener." Usually the addition of one fluid ounce of this liquid to three hundred gallons of solution will have the desired effect. It should be well stirred in and solution allowed to settle before using. Should this prove to be not quite enough a very little more may be added in the same manner. This, of course, must be repeated at intervals as required.

The brightness of the plating from solutions thus treated depends largely upon how the work is hung in, distance apart on the work rod, and whether work is wired or racked, work which is not hung too closely coming bright more quickly as a general thing. It also depends upon the amount of magnesium sulphate in the solution, it being worthy of note that when the solution is rich in magnesium sulphate the "brightener" is more effective.

The writer makes no claim to originality in what he has set forth in this article but has simply given his experience and conclusions, trusting they may be of benefit to the trade.

METAL RECOVERED FROM SCRAPS AND DROSSES

The value of the copper, lead, zinc, tin, aluminum and antimony recovered in the United States from scrap skimmings and drosses in 1915 was $114,304,930, against $57,039,706 in 1914, a 100 per cent. increase. This large gain, says the United States Geological Survey, was caused by greater recoveries and much higher average values for all metals. A large demand for metal products, particularly for those to be exported, made 1915 the most prosperous year in the waste metal trade.

The imperative demand for zinc and copper by munition manufacturers and for foreign trade made spot metal very scarce. Secondary metals not desired for these purposes were generally available for domestic uses when virgin metal could not be purchased for prompt delivery. The incentive of high prices caused all metal wastes to be more carefully saved, segregated, and refined.

The output of secondary copper, including that in brass and other alloys, was 196,000 tons in 1915 against 128,000 tons in 1914. The value of this copper and brass amounted to more than $70,000,000.

The secondary lead recovered in 1915, including that in alloys, was nearly 79,000 tons, an increase of 28,000 tons, a quantity exceeded by the primary domestic output of only three States—Missouri, Idaho and Utah.

The amount of secondary zinc recovered in 1915 was 92,575 tons. At least 4,000 tons of zinc chloride and 46,000 tons of lithopone were manufactured. The zinc used in these products is derived mainly from zinc drosses and skimmings.

The output of secondary tin increased from 12,447 tons in 1914 to 13,650 tons in 1915 and was equal to 24 per cent. of the tin imported as metal or as oxide into the United States.

The average price of antimony was abnormally high and the secondary recoveries in 1915 amounted to 3,102 tons, valued at $1,811,568, an increase in quantity of 355 tons and in value of about $1,367,000.

Aluminum was both scarce and very high priced the latter part of 1915 and the secondary metal recovered, 8,500 tons, was valued at $5,802,000.

CORUNDUM.

Corundum mining in the United States has ceased, while Canadian production dropped from $239,091 in 1912 to $72,176 in 1914. Artificial abrasives are used.

METALLURGY OF THE RARER METALS

IMPORTANCE AND FUTURE OF MAGNESIUM, CALCIUM, CHROMIUM AND OTHER METALS.

An interesting paper on "The Metallurgy of the Rarer Metals" was presented by Prof. J. W. Richards, of Lehigh University, South Bethlehem, Pa., before the eighth semi-annual meeting of the American Institute of Chemical Engineers in session at the Statler Hotel, Cleveland, Ohio, June 14 to 17, 1916. Professor Richards stated there are many metals which may be called the rarer metals but the most interesting among these, both to the metallurgist and economist, are those metals whose compounds are relatively cheap and which command high prices because of the difficulty of their reduction. These are metals whose market prices may at some time be reduced anywhere from one-half to nine-tenths by improved methods of reduction. He said that if his paper had been written 30 years ago, aluminum would be one of the metals that would be discussed, being in 1886 one of the rarer metals selling at $10 per lb. The silicon industry furnishes another example of great reduction in the cost of the metal. This, in 1900, was selling as a chemical curiosity at over $100 an ounce; now 10c. per pound is a good market price for it.

BERYLLIUM AND BORON.

The speaker referred at length to the number of metals that at present command high prices, but which by improved metallurgical processes might be made very cheaply. These include, Beryllium, boron, magnesium, calcium, strontium, zirconium, molybdenum, barium, titanium, chromium and cerium (mixed metals of the cerium group). He said the present methods of reducing beryllium are tedious and costly and that it is not to be expected that this metal can be made cheaply until someone masters the direct electrolysis of the oxide, dissolved or suspended in a more stable melted salt, which is by no means an impossibility. He said this metal being white, malleable and unchanged in air, with a specific gravity of 1.64, would make it particularly useful for objects where great lightness and permanence in air are the first consideration, with the cost secondary. He characterized it as a metal that will repay extended metallurgical research and minute physical and chemical study of its many unique properties.

MAGNESIUM AND ITS FUTURE.

Professor Richards said that the metallurgist has not made a fraction of the progress that he should have made with magnesium. Although magnesium oxide costs only a few cents per pound the metal sells for about as many dollars per pound and is scarce. But it is believed that, by improving the methods, the reduction of magnesium can be produced at 25c. per lb. He said that while the war lasts, with its enormous demand for magnesium for military purposes, the price will remain in the dollars per pound, but with improved processes that are being developed he believes that after the close of the war, with normal industrial conditions, magnesium will sell at a price which will take it out of the class of rarer metals and put it among the common ones. As the price goes down its industrial uses will increase in geometrical proportion, and instead of the production being expressed in thousands of pounds per year it will reach thousands of tons. This will be one of the by-products of the war's stimulus to metallurgical industry.

The speaker said that the possibilities held out to the metal industry by reasonably cheap magnesium are extremely interesting, and that it is quite possible that alloys analogous to dur-alumin may be discovered, as strong as soft steel with only 30 per cent. of its weight, which will find extensive use in aeroplanes and dirigibles. Such alloys may largely displace aluminum alloys, which are now used by the thousands of tons annually in the automobile industry, with a saving of one-third in weight which will compensate for the higher first cost. He predicted that the metallurigal use of magnesium will also be greatly extended by its lower price, such as for deoxidizing brass, copper, bronze, nickel and monel metal, since it is a much stronger deodorizer than aluminum. In fact, aluminum has blazed the way into numerous uses for which magnesium, as soon as it becomes cheaper, will compete and replace its older sister. He predicted a large future for magnesium as one of the common metals of every-day life.

CALCIUM IN ALLOYS AND AS A DEOXIDIZER.

Calcium, strontium and barium were referred to as the trio of highly interesting elements, common enough in nature but scarce and of high price because of the metallurgical lack of efficient and cheap methods of reduction. Calcium was referred to at present as a semi-rare metal which could be produced much cheaper by present methods if made on a large scale to fill a large demand. The principal trouble at present is in finding uses for the large production. He said its possible alloys with other light metals should be exhaustively studied, and that another large possible use is as a chemical purifying agent in melting and casting metals.

A small addition of metallic calcium might be used to reduce the amount of sulphur and phosphorus in steel, and other metals and alloys whose properties are damaged by sulphur or phosphorus may be similarly refined or improved. Barium was referred to as a metal that could be obtained in large quantities if its uses were developed. As barium is a good conductor, its use was suggested for electrical contrivance, and there are possibilities that its cost can be very materially reduced.

GROWING IMPORTANCE OF CHROMIUM.

The fact that the use of chromium in steel is rapidly extending to all varieties of extra hard and high-speed steel was referred to and the paper stated that the use of pure chromium is limited by its high cost of production and our lack of knowledge as to how to handle it and its possible useful effects. For example, chromium electroplating is white and durable and for many purposes may be superior to nickel and almost equal to platinum plating, but the technique of always getting perfect plating has not been mastered.

Ferrochromium alloy carrying high carbon (6 to 8 per cent.) is produced cheaply in crucibles, cupola furnaces, blast furnaces and electric furnaces. Low-carbon ferrochromium commands three to five times as high a price because of the difficulty of decarbonizing the raw product. The speaker hoped that a test would be made in the electric shaft furnace to see if it is not possible to produce directly from the ore a low carbon product and said the present prices, $100 and $500 a ton respectively for the high and low alloys, would warrant a great effort in that direction.

Professor Richards stated that the metallurgy of chromium is full of attractive possibilities and the usefulness of pure chromium in the field of alloys is only beginning to be scratched.

THE CASTING OF METALS IN CHILL MOLDS.*

THE EFFECTS ON THE MECHANICAL PROPERTIES OF COPPER ALLOYS USED FOR GOVERNMENT WORK BY POURING INTO IRON OR STEEL MOLDS.

BY J. JOHNSON, M.Sc.

(Concluded from June.)

BOTTOM RUNNING.

To arrange for bottom-running in chill molds is extremely difficult owing to the danger of freezing of the metal at any point of flow where there is a constriction of sectional area. To overcome this difficulty the author proposed to arrange gate and runners in sand, each runner supplying a chill mold. In this way the necessary head of metal is obtained for efficient feeding, a small riser to each chill mold allowing of escape of gas, air and dross. Bottom-running has the advantage that hot metal is continually coming up and pushing it in front of it the floating dross, and, as solidification cannot commence until the mold is full, every facility is afforded for the escape of air and gases. (See Fig. 3).

The lettering A, C and D, corresponds with the lettering in Fig. I, with the exception that D acts as riser instead of gate. E represents main gate to four or more molds.

FF are the runners formed in the sand-bed G by the withdrawal for a measured distance of the square iron rods B.

HH are the clamps for the molds.

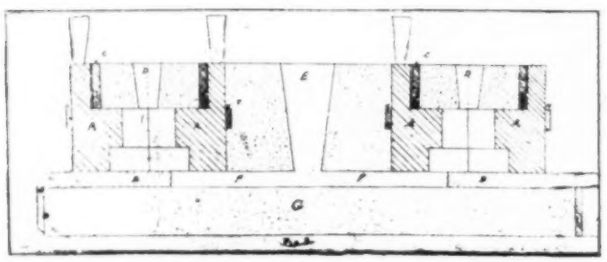


FIG. 3. AN EXAMPLE OF BOTTOM RUNNING.

The sketch represents a proposal to cast a number of adapters together. The chill molds are arranged in a circle on the sand-bed G, and the completely enclosed space is filled with sand round a taper plug at E which is afterwards withdrawn. The square iron rods B are also withdrawn laterally to such a distance (peviously marked) as will leave the runners F clear. Metal is poured in at E, flows along F, fills the mold and risers D which effect the necessary feeding. It is realized that this method would not recommend itself as a commercial proposition, but it represents the manner in which the author, with the limited resources and limited time at his disposal, was enabled to experiment with bottom-running. The results obtained showed that:

(1) All the necessary feeding was supplied by the risers D, thus showing that the gate and runners need not necessarily be in sand.

(2) The surface-condition of the casting was good.

(3) The amount of "casters' scrap" was large.

Should there be no serious objections to producing so large a mountain of scrap, it would appear that the method of "bottom-running," arranging gate, runners and casting in "chill," with riser in sand to do the necessary feeding, offers the best prospects of producing clean castings.

COMPOSITION OF ALLOYS FOR CHILL CASTINGS.

The problem which the author was first called upon to face was how to produce in the form of a casting an alloy which would give as good results in the manufacture of fuses and meet the same stringent specifications for mechanical tests as some of the highest qualities of rolled brass bar. The Government specification for "A" metal to which reference is here made is as follows:

Yield Point, 20 tons per square inch.

Maximum Stress, 30 tons per square inch.

Elongation, 20 per cent. on length $= 4 \sqrt{\text{area}}$.

In order that risks of premature explosion of shells may be avoided, the presence of lead was prohibited except in very minute proportions, namely, .01 per cent. Although this was afterwards altered to .10 per cent., it is obvious that there was no hope of supplying the huge demand created in the early days of 1915 from the existing stocks of lead-free brass and zinc.

There was nothing for it but for the responsible authorities at Woolwich to fall back upon the commoner grades of metal, and to suitably and effectively coat them with a metal or substance which contained no such injurious element as lead. It is the ready formation of lead picrate which owing to its explosive action, has to be circumvented at all costs.

The presence of lead in brass, has, however, two other important effects, one good and the other bad, namely, the improvement in the machining properties and the impairment of the mechanical properties.

In order to emphasize the superiority in mechanical properties of chill castings over sand castings it will suffice to cite a few instances from recent literature. (See Table I.)

TABLE I.

Composition.	Condition.	Yield Pt. Tons Per Sq. In.	Breaking Stress Tons Per Sq. In.	Elongation, Per Cent.	Reference.
Cu. 85 Al .5%	Sand-cast	4.3	18.1	75	8th Report.
Ditto	Chill-cast	7.1	18.1	60.5	Alloys
Cu. 90 Al 10	Sand-cast	11.3	31.7	21.7	Research,
Ditto	Chill-cast	12.4	56.93	30.5	Inst. Mech. E., Carpenter & Edwards. 1907.
Cu. 88 Al 10, Mn 2	Sand-cast	13.2	34.44	24.0	9th Report. Inst. Mech. E.,
Ditto	Chill-cast	16.8	37.00	25.0	Rosenhain & Lantsberry. 1910.
Cu. 56%, Zn. 41%, Fe. 1.5%, Sn. 0.90%, Al 0.45%, Mn. 0.15%	Sand-cast	...	33.4	20.0	THE METAL INDUSTRY, Oct., 1912. Gillett.
	Chill-cast	...	38.4	25.0	

This small quantity of aluminum has a remarkable influence on the fluidity and surface of these alloys, as is exemplified in alloys J2a and J2c. The desired

increase in strength was hoped for from larger additions of manganese and iron.

An important modification of the specification had been introduced at this point, B metal having been substituted for A metal, and the lead restriction had been eased. The specification for B metal is:

Yield point .....12.0 tons per sq. in.
Max. stress .....20.0 " " " "
Elongation.....30.0 per cent. on length = 4 $\sqrt{}$ area.

In table II are given the results of experiments to produce a chill-casting of B quality.

While much work remains to be done to ascertain the individual influence of each metal, it nevertheless seems fairly certain that manganese has only a mild influence whilst that of iron is more intense. These two metals together give the brass a paler hue, but also consolidate the structure, giving fineness of grain and increased toughness. The micrographs show how the crystalline structure is altered, a much finer structure resulting from the addition of manganese.

The behavior of these alloys under stress is quite different from that of pure copper-zinc alloy, which shows the external surface lines usually associated with cast brasses. The surface of the stressed bars J2a, J2b and J2c is smooth, resembling that of cold-drawn rod. The fracture also is silky and shows a tendency to cup. These alloys, particularly J2a, behave exactly like drawn rod.

The presence of one per cent. of lead does not affect these features, but improvement in machining properties is obtained and the cost of the alloy reduced. The risks which would result from its contact with picric acid are obviated by other means, that is, tinning or nickel-plating.

The small addition of aluminum, whilst adding to the strength, produces an extraordinary improvement in casting qualities. An examination of the surfaces of the two castings reveals the superiority of surface produced by aluminum. Without aluminum the alloy is pasty and and runs sluggishly, the casting having a dull surface and not exhibiting a clean, sharp impression of the mold. With aluminum the alloy becomes enlivened, has greater fluidity and produces a sharper casting with a very smooth surface. These effects must be attributable to the strong deoxidizing power of aluminum which apparently removes the viscosity due to insoluble oxides (present in a finely divided state in suspension) by reducing them to the metallic state.

To recapitulate:

(1) Manganese and iron improve the mechanical properties of these brasses.

(2) Lead improves the machining properties.

(3) Aluminum improves the strength and casting properties. It is important however, to prevent the entry of dross into the mold.

The influence of iron alone on brass has not been studied in any detail. Hofman states that up to 3 per cent. Fe strengthens and hardens "brass," increases the malleability when hot, and the resistance to corrosion.

The author concluded with a reference to the rapidly increasing production of fuse plugs, sockets, fuse-bodies, etc., by means of presses or stamps which forge the cast blank into rough shape. In this way the mechanical properties are improved, and, where the shape of the article is complex, a good deal of cutting away is avoided.

After a brief survey of the common metals available, of the extent of the demand and of the class of labor available, the author decided that the copper-zinc alloys offered the most promising field for the brief research possible, owing to the large sources of supply of the component metals, to their comparative cheapness and to the familiarity of the local brass-caster with them. It was immediately realized that no alloy of copper and zinc, without the addition of some other metal, could give the desired results.

Attention was therefore given to the so-called manganese bronzes which are copper-zinc alloys, to which other metals, such as manganese, iron, tin and alumi-

TABLE II.—CHILL CASTINGS.

	Composition.						Casting Qualities.		Mechanical Properties.					
No.	Cu. %	Zn. %	Mn. %	Fe. %	Al. %	Pb. %	Behavior in pouring.	Surface Condition of Casting.	Government Quality.	Yield Pt. Tons per Sq. In.	Maximum Breaking Stress Tons Per Sq. In.	Elongation % = 4 $\sqrt{}$ area	Appearance of Surface Portion.	Appearance of Fracture.
J 2A.	61.9	33.5	3.0	1.4	nil.	0.1	Pasty.	Scabby.	G	11.41	25.0	50.0	Smooth.	Pale yellow, Silky. (Resembling drawn rod.)
J 2B.	61.97	32.6	3.0	1.4	nil.	1.0	Ditto.	Ditto.	G	10.45	24.1	45.0	Ditto.	Cupped. Ditto.
J 2C.	61.81	29.97	4.79	2.11	0.21	1.1	Fluid.	Very smooth and glossy.	B	12.4	24.8	42.0	Ditto.	Ditto.
CH 9A.	62.6	36.3	nil.	...	nil.	1.0	Ditto	.....	C	7.59	22.6	29.0	Very wavy.	Full yellow, Dull.

Of the alloys in the above table one (J2C) satisfies the requirements of the government specification for B metal. It behaved satisfactorily in casting and machining.

The copper was purposely kept at approximately 62 per cent. for the following reasons:

(1) Brass casters often arrive at a higher copper content than required, e. g., a mixture required to be 60-40 would often analyze 62-38 or even higher in copper.

(2) It seemed advisable, when aiming to produce an alloy having a minimum of 30 per cent. elongation to avoid those having an undue proportion of the beta constituent.

num are added in various proportions. The following composition is given by Gillett:

Copper	56.0 per cent.
Zinc	41.0 "
Iron	1.5 "
Tin	.9 "
Aluminum	.45 "
Manganese	.15 "

The results of mechanical tests on a chill-cast alloy of this composition is given as follows:—

Maximum breaking stress, 38.4 tons per square inch.

Elongation, 18.0 per cent. minimum, 25.0 per cent. maximum.

An alloy of this type, modified in composition to ensure percentage elongation of over 20 per cent. was made up and tested in the form of a ¾ in. square chill cast bar.

The composition of this alloy by analysis was as follows:—

ANALYSIS OF ALLOY C.H.I.

Copper	58.64
Zinc	38.9
Tin	1.053
Manganese	.926
Aluminum	.162
Lead	.107
Iron	.212
Total	100.00

RESULTS OF MECHANICAL TESTS.

Yield Pt. ..... 17.25 tons per square inch
Maximum Breaking Stress... 30.4 " "
Elongation..... 22.5 per cent. on length $= 4\sqrt{\text{area}}$.

It will be seen from the test figures that this, the first attempt, failed only in yield point, and by a very little, to meet the specification for a metal.

(The End)

MUNTZ METAL

SOME INTERESTING DATA ON THE HEAT TREATMENT OF THIS METAL.

BY G. C. HOLDER.

The heat treating effect on Muntz metal is varied, which is shown by its physical properties. Muntz metal as is well known consists of 60% copper and 40% zinc. Various amounts of impurities may be contained in the alloy, antimony is very harmful, while lead is conducive to weakness, because lead whenever introduced into an alloy of this nature is held in suspension mechanically.

The physical properties of a cast Muntz metal is as follows:

7,170 pounds per sq. in. at elastic limit
26,239 " " " " " ultimate "
45 % elongation in 2 inches
35 Brinell hardness number.

Unannealed cold, rolled, forged specimen:

24,416 pounds per sq. in. at elastic limit
52,416 " " " " " ultimate "
54 % elongation in 1 inch
26 scelerescope hardness
108 Brinell hardness number.

Specimens annealed at various temperatures and time, quenched in water:

Annealed at 1100° F. for 45 min.:

21,952 pounds per sq. in. at elastic limit
48,608 " " " " " ultimate "
48 % elongation in 1 inch.

Specimen annealed at 1160° F. for 45 min.:

22,848 pounds per sq. in. at elastic limit
53,616 " " " " " ultimate "
46 % elongation in 1 inch.

Specimen annealed at 1220° F. for 45 min.:

24,640 pounds per sq. in. at elastic limi
58,912 " " " " " ultimate "
30 % elongation in 1 inch.

The scelerescope hardness number upon specimens annealed at temperatures from 1060° F. for 45 minutes to 1220° F. for 90 minutes ran from 25 to 26. The annealing had the effect of making the metal more uniform when compared with the unannealed.

Specimens annealed at 1450° F. for 1 hr. were uniform in hardness and a few points softer than the original. Specimens annealed at 1350° F. for 50 minutes were more uniform, but showed no difference from the original. Where the specimens were annealed at 1220° F. for 40 minutes the material was a trifle harder than the original and not any more uniform.

Metallographically Muntz metal consists of the alpha and beta phases and is homogeneous at about 1470° F., forming the beta solid solution. As the temperature decreases rich copper solution throws out crystals of a second solution, alpha, while the zinc rich solution throws out crystals of a compound CU_2ZN_3. As the temperature falls the area of the Beta solid solution decreases until 850° F. is reached, when the Beta solution has no stable existence. Therefore when two solid solutions are in equilibrium with one another, their composition usually changes as the temperature falls, so that the graphic lines separating the different fields are not vertical but inclined or curved.

In Muntz metal the annealing process brings the relative proportions of the two components to those required by equilibrium by removing supersaturation. Muntz metal when rapidly cooled from about 1470° F., consists only of Beta solution. If heated to a temperature below the transformation period, which is about 1360° F., crystallization of the alpha constituent takes place and continues until the proportions of alpha in beta has been attained. If the time of annealing has been insufficient the beta crystals are apt to become enveloped with alpha, which is conducive to weakness.

Muntz metal slowly cooled through the transformation range shows alpha crystals having a characteristic structure similar to aluminum bronze.

The beta constituent gives to alloys in which it occurs the property of being ductile at higher temperatures, which accounts for the fact that Muntz metal is worked hot. On the other hand, beta crystals or alpha and gamma crystals are less ductile at the ordinary temperature than alpha. Muntz metal quenched from above 1375° F. is harder and stronger, but less ductile than an annealed alloy.

Judging from the foregoing a vast number of conditions can be obtained by variation of heat treatment, depending entirely upon service condition.

For thoroughly annealed Muntz metal a temperature of 850° F. maintained for some time, and the material cooled in air, will suffice, as under the above conditions maximum ductility will be obtained.

If the material is desired hard, 1525° F. will be the proper temperature and will give about 65,000 pounds per square inch ultimate load and 37% elongation in 1".

THE MANUFACTURE OF DETONATING FUSES FOR HIGH EXPLOSIVE SHELLS

AN ARTICLE DEALING WITH METAL WORKING BY MEANS OF AUTOMATIC MACHINERY.

WRITTEN FOR THE METAL INDUSTRY BY A PRACTICAL EXPERT.

Owing to the large contracts secured for the manufacture of fuse parts or body used in shrapnel and high explosive shells in the United States which are now keeping a number of plants busy day and night, it has been thought that a brief description of their manufacture would be interesting.

Fig. 1 shows the types of high explosive shells used by American, British, French and Russian governments. The British shell No. 2, as shown, carries a charge of a high explosive, generally lydite. A nose fuse or body is used and the fuse operates on percussion only. The fuse body shown in Fig. 3 is known as the British 100 gram high explosive fuse and is used in

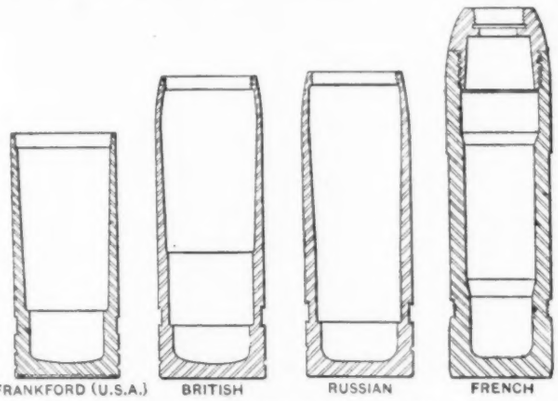


FIG. 1. STYLES OF SHRAPNELL USED BY DIFFERENT COUNTRIES.

British high explosive shells which are used in field guns. This fuse explodes upon impact only and screws into the nose of the shell, and all of the parts of it, with the exception of the adapter and gaine, are made of brass.

The body of the fuse shown completely finished in Fig. 4 is a simple looking brass piece weighing two pounds ten ounces and is made from a slug or block cast from a composition of 59 per cent. copper, 39.45

FIG. 2. LADLE WITH SHIELD APPLIED.

per cent. zinc, 0.88 per cent. manganese copper, 0.49 per cent. phosphor copper and 0.18 per cent. aluminum. This composition is not arbitrary but has been found to give the best results in forging and in tensile strength required by the specifications.

The casting operation is the most simple one of the whole fuse, as it can be performed by unskilled labor, as the blanks are cast in iron chill molds which are bored out to the required diameter and depth. The chills are given a coat of lubricant consisting of lard oil and graphite after each heat is poured, which forms a smooth oxidation inside the molds and allows the

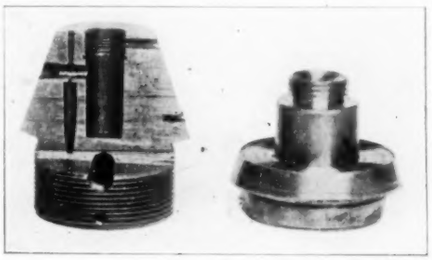


FIG. 3. SHOWING ALL THE OPERATIONS ON A BRITISH 100-GRAM HIGH EXPLOSIVE FUSE.

blanks to come out of the chills with a smooth outside surface. After casting, the blanks are machined on one end of the face only, as there is a certain amount of shrinkage in the center of the casting owing to the composition of the metal used and also owing to the weight.

The casting is machined off on the face and a cavity is made in the center on a fourteen inch brass lathe manufactured by Bardons & Oliver, Cleveland, Ohio, and the casting is held in place by an air chuck, Fig. 5, made by the Manufacturers' Equipment Company, Chicago, Ill. A two bladed drill for facing the lathe is run at a speed of 750 R. P. M., and the average production is about 200 per hour. The castings are also faced off so that they weigh two pounds six ounces, which does not allow any waste

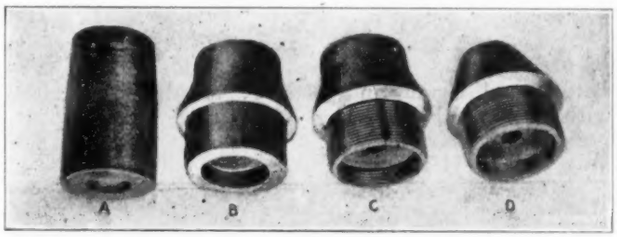


FIG. 4. SEQUENCE OF OPERATIONS ON THE BRITISH 100-GRAM FUSE.

or surplus metal when they are forged. The castings are uniform in diameter, as there is great care taken in making each mold or chill uniform in size. This method superseded the casting in sand, owing to the variation in shrinking of the castings.

After being machined the castings are then taken to the Stewart gas furnace shown in Fig. 6, where they are heated to a temperature of 1400 degs. Fahr. These furnaces are double ended. A percussion press made by the Zeh & Hahnemann Company of Newark, N. J., Fig. 7, is situated at one end of the furnace. Three men are required for the furnace and the press; one man loads the furnace from the rear, another takes the heated blanks out of the furnace and puts them in the dies and trips the press and the third man removes them from the dies. The average output from each press is from 1,500 to 2,000 forgings per ten hours.

The dies are swabbed out with a compound composed of lard oil, graphite, soda ash and water.

For the first machining operation the brass body is held in an air chuck, as shown in Fig. 5, with the piece or end to be threaded projecting. The first operation consists in box-tooling; second, facing the end, chamfering and roughing chamber; third, finish counter-

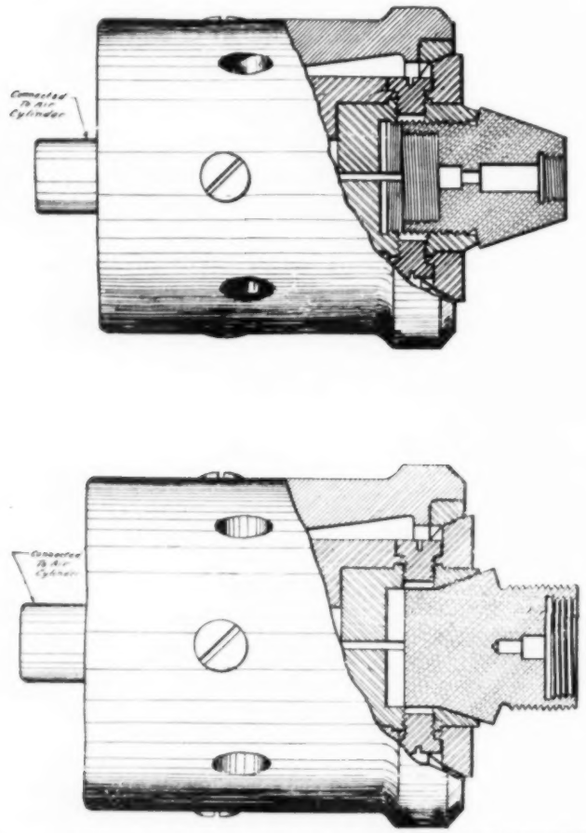


FIG. 5. THE COLLET AIR CHUCK OF THE MANUFACTURERS EQUIPMENT COMPANY, CHICAGO, ILL., USED IN MACHINING BRASS BODIES.

boring and chamfering outside; fourth, undercutting with forming tool in cross slide block; fifth, tapping; and sixth, threading with geometric collapsible die,

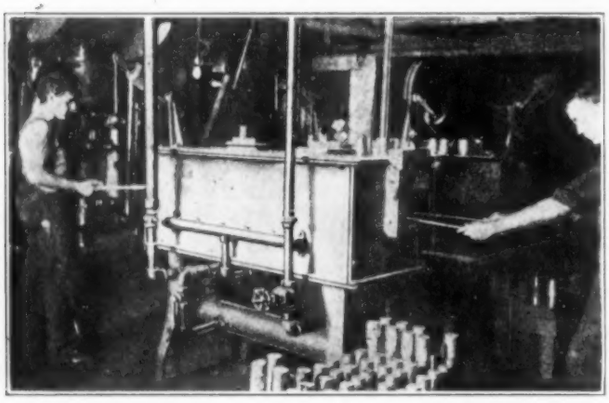


FIG. 6. THE STEWART GAS FURNACE FOR HEATING BRASS SLUGS, MADE BY THE CHICAGO FLEXIBLE SHAFT COMPANY, CHICAGO, ILL.

using back gear on spindle lathe, to reduce speed to hold a uniform size a band threading operation is necessary to size the thread, owing to the close limits allowed.

On account of the hardness of the metal after passing through the percussion press the castings are annealed in a gas furnace to a temperature of 1,280 degs. Fahr., which allows the castings to be machined without using a lubricant. The second machining operation on the fuse body consists in finishing the taper end. The male threaded end that has been machined off is gripped in an air chuck having threaded jaws. The first operation consists of centering; second, drilling and roughing turn; third, drilling and roughing counter bore; fourth, recess; fifth, tapping; sixth, undercutting or shaving angle with tool held in undercut

FIG. 7. ZEH & HAHNEMANN, NEWARK, N. Y., 70-TON PERCUSSION PRESS FOR HOT PRESSING FUSE BODIES.

block. These operations practically finish the body with the exception of several drilling operations that are done on three spindle drilling machines manufactured by the Henry & Wright Company and also on the Leland & Gifford high speed drilling machines by the aid of a simple jigs, shown in Fig. 8.

Following the machining operations just described the fuse body passes through quite a number of drilling, tapping and counterboring operations. The first operation consists in drilling the cap set screw hole, the centrifugal bolt hole and the adapter set screw hole. For this operation a three spindle drilling machine is employed. The four operations are performed on the three spindle machine because the cap set screw hole and the adapter set screw hole are of the same diameter therefore machined by the same drill. The second set of drilling operations on the body consists in drilling the detent spring hole with a drill in one spindle of a three spindle drilling machine. The sec-

ond spindle carries a counterboring tool that squares the bottom of the hole and the third spindle carries a counterboring tool. The third set of drilling operations on the body is the drilling of the hole for the reception of the detent and this is performed on a two spindle drill press, each spindle carrying the same size of drill except that the depth drilled is deeper with one than the other.

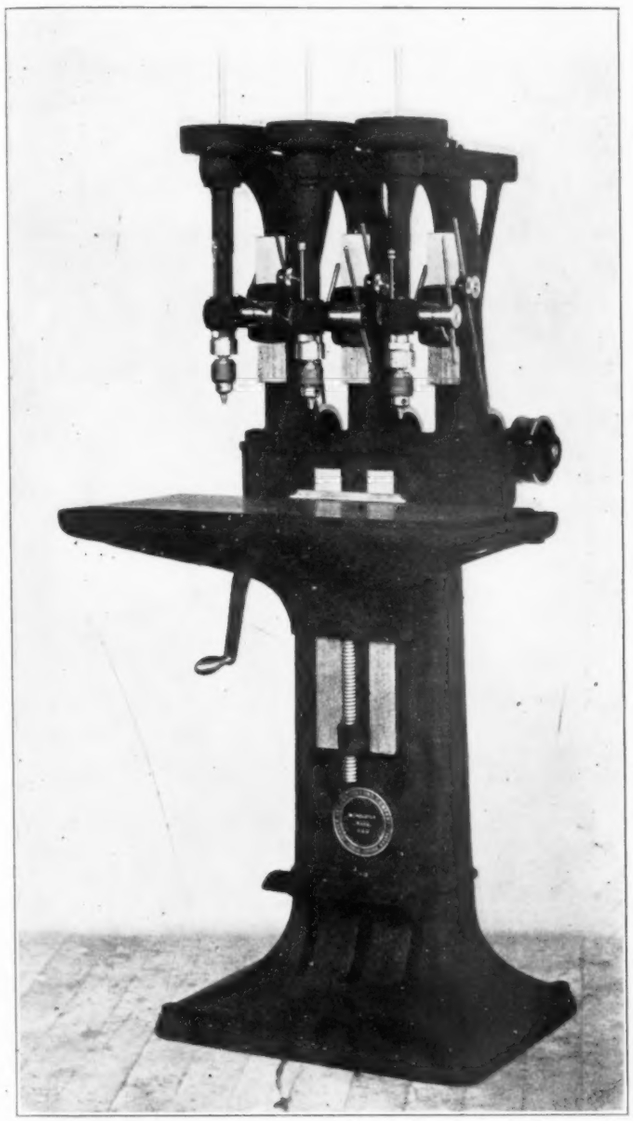


FIG. 8. THREE-SPINDLE DRILLING MACHINE USED ON FUSE BODIES MADE BY LEELAND-GIFFORD, WORCESTER, MASS.

The fourth set of drilling operations is performed on a three spindle drilling machine and the first spindle carried a drill for drilling the central percussion pellet hole indicated. The second spindle carries a counterboring tool, and the third a bottoming tool.

There are other drilling operations performed to complete the body similar to the ones described, when the last machining operation is accomplished, which consist of tapping five holes, namely the set screw holes for the cap and adapter, the detent spring hole, the centrifugal bolt holes and the percussion pellet hole. Four separate spindle heads are used which carry an automatic tapping chuck such as is manufactured by the Peter Brothers Manufacturing Company of Algonquin, Ill., shown in Figs. 9 and 10.

FIG. 9. WOODSTOCK REVERSING TAPPING ATTACHMENT, SHOWING SAFETY TAPPING CHUCK.

The many screw holes, powder passages and wrench flats in the parts of either time or detonating fuses have been responsible for the development of some unusual machines and fixtures for this work owing to the close inspection these articles are subjected to in

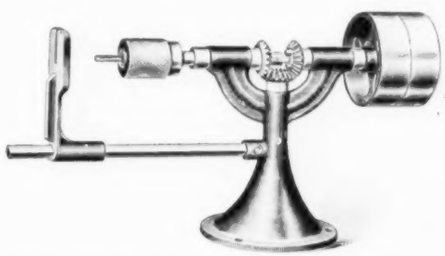


FIG. 10. WOODSTOCK TAPPING AND THREADING MACHINE, SHOWING SAFETY TAPPING CHUCK.

the course of their manufacture and at the final government inspection. Success in the manufacture of these fuses seems to be obtained in two directions, with simple machines and special fixtures built especially for the work in hand.

DESIGN AND WHAT IT MEANS.

In the article published in the June issue of THE METAL INDUSTRY by A. F. Saunders bearing the above title there appeared a photograph of a bronze vase which bore the caption "Athens Bronze Vase." This was incorrect and crept into the article by mistake. The vase should have been labeled merely "An Example of a Design Along Lines of Accepted Principles."

ALUMINUM PLANT NEARING COMPLETION.

The Japan Aluminum Manufacturing Company, which has recently been floated by Tokyo, Osaka, and Nagoya capitalists with capital of 1,000,000 yen ($498,500) is building a factory at Rokuga-mura, a suburb of Nagoya. It is to be completed in the course of July, and operations are to be started in August. The management of the company intends at the start, the *Japan Chronicle* states, to turn out about 250 tons a year.

SOLUTION OF PLATINUM IN AQUA REGIA.

A Few Experiments with Aqua Regia of Different Concentrations.

Written for The Metal Industry.

By C. M. Hoke, A.B., B.S., A.M., Consulting Chemist, Jewelers' Technical Advice Co., N. Y., and Robert J. Moore, B.S., Chem. Department of Chemistry, Columbia University, N. Y.

While it is a matter of commonest knowledge that gold dissolves readily in aqua regia, it has been observed that it is not universally known that platinum also dissolves in it. This is due first to the comparative newness of platinum as an everyday metal, and second to the fact that it dissolves very slowly, and that it keeps its bright lustre even while being attacked.

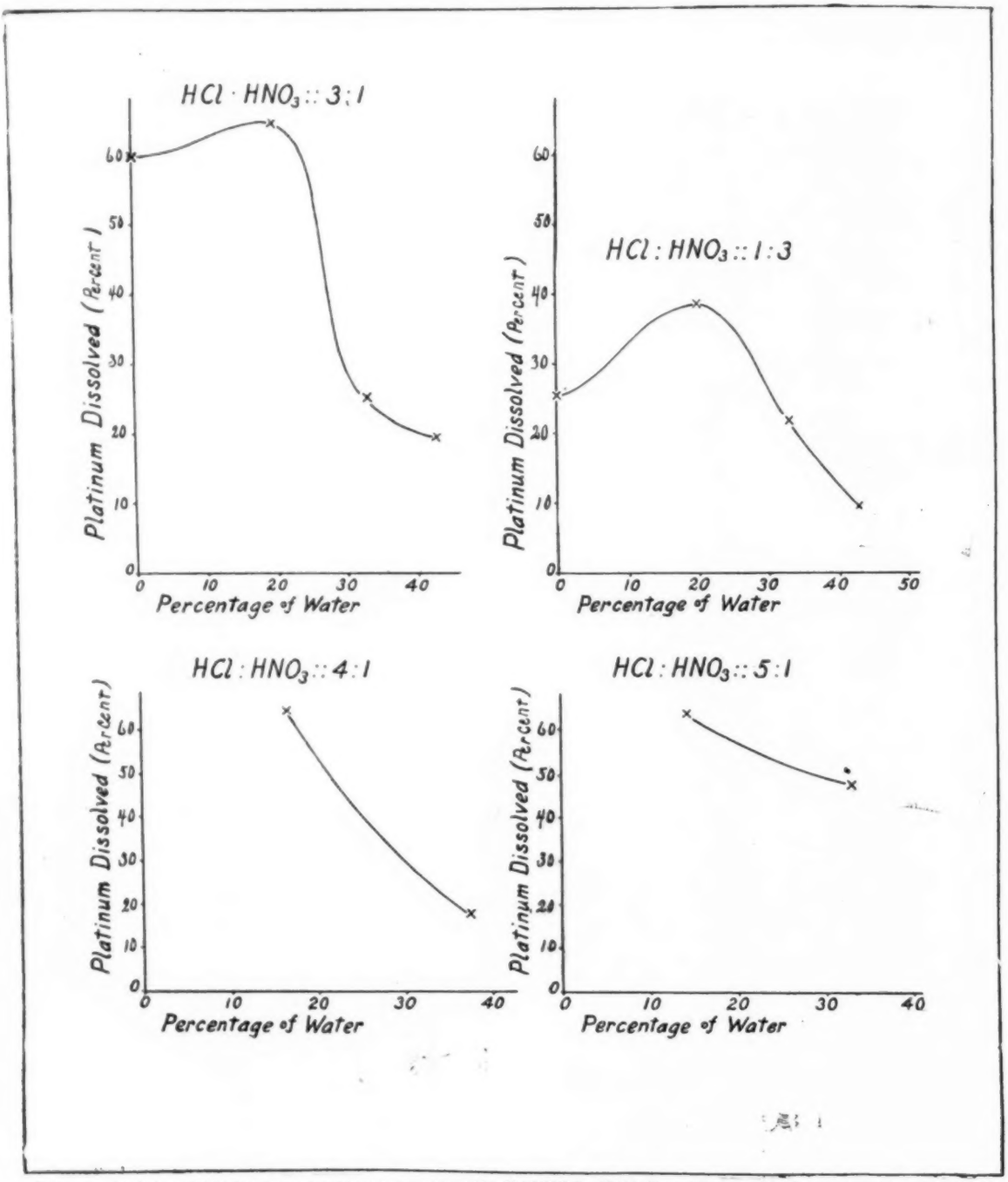


FIG. 1. CURVES SHOWING THE RESULT OF ADDING VARYING AMOUNTS OF WATER TO A NUMBER OF MIXTURES OF HYDROCHLORIC AND NITRIC ACIDS. (HCl = HYDROCHLORIC ACID; HNO_3 = NITRIC ACID.) IT WILL BE SEEN THAT THE GREATEST AMOUNT OF PLATINUM IS DISSOLVED WHEN THERE IS SOME WATER PRESENT—20% OR LESS, AND WHEN THE PROPORTION OF HYDROCHLORIC ACID IS HIGH.

It has also been found that there is some difference of opinion as to just what aqua regia is. Most of the textbooks are vague, saying simply that it is a mixture of hydrochloric and nitric acids. One or two specify three parts hydrochloric to one of nitric; another says three or four parts to one. Since no particular concentration of acids is mentioned, it is understood that the ordinary concentrated acids of trade are meant; these contain considerable water.

Among the jewelry workers who handle aqua regia (usually the electroplater and the refiner), this same vagueness exists in an exaggerated form. One man holds that aqua regia is a half-and-half mixture; another swears by a two-to-one, or a three-to-one mixture. In this article, as in general acceptance, aqua

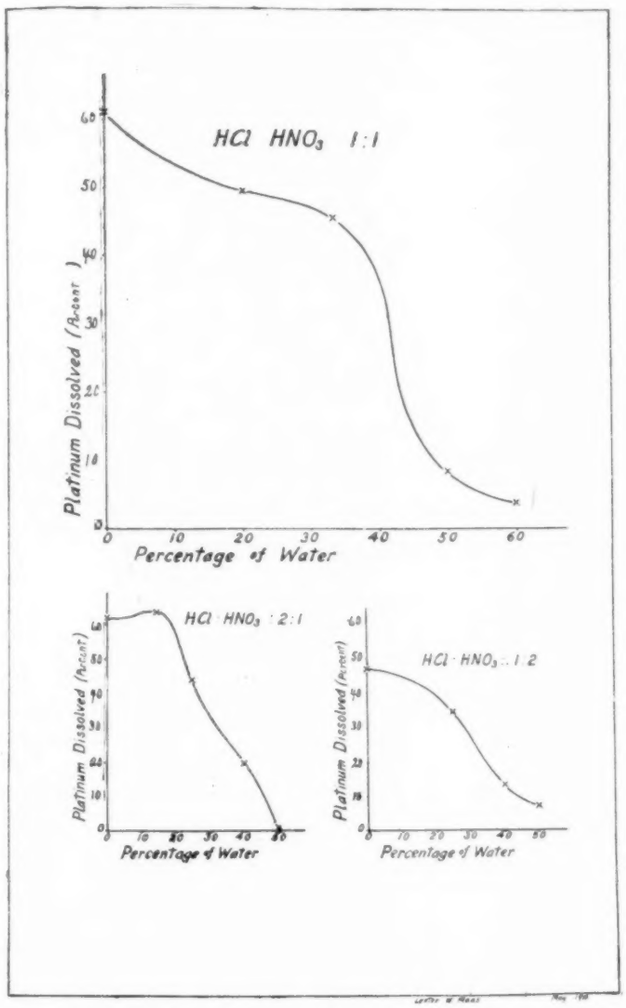


FIG. 2. SOME MORE CURVES OF THE SAME TYPE AS THOSE SHOWN IN FIG. 1.

regia means any mixture of the two acids, with or without water; and the ordinary concentrated solutions of trade, such as are sold by the regular supply houses, have been used.

OBJECT OF THE INVESTIGATION.

Aqua regia is used constantly in the refining of platinum, and in "cutting down" platinum for electroplating solutions, etc. One of the common methods of refining mixed gold-and-platinum filings involves, as one step, a treatment with cold aqua regia. This dissolves the gold and a certain amount of platinum. It is desirable that there be no excess nitric acid left in the solution, because that interferes with later operations. It is desirable that the solution be fairly concentrated, so as not to be bulky, and so as to make easy the recovery of the dissolved platinum. At the the same time it must not be too concentrated, else the silver chloride (formed from the alloy in the gold) will dissolve in it, only to reappear later when it is not wanted.

The object of these experiments was to compare the differences that there were in the action of different proportions of hydrochloric and nitric acids and water, acting in the cold.

METHOD OF WORKING.

Exactly a gram of clean, sieved platinum filings was placed in each of twenty-six little beakers. They were regular jewelers' filings, containing 10% iridium. Then each beaker was filled with a good quantity of aqua regia, in each case a different mixture. All the usual mixtures were tried, and several others. They were put away in a quiet place for 96 hours, in a cabinet whose temperature was kept constantly at 70 degs. F. Now and then they were stirred by a gentle rotation of the beaker. Finally the solution was carefully poured off, the metal washed clean with distilled water, dried and weighed.

THE TABLE AND CURVES.

The table gives the percentage of each acid and water used, and the per cent of platinum dissolved in each case.

TABLE I.

Number of experiment.	Per cent hydrochloric acid.	Per cent nitric acid.	Per cent water.	Per cent platinum dissolved.
Equal amounts of hydrochloric and nitric acids:				
1	50	50	0	61.0
2	40	40	20	49.5
3	33 1/3	33 1/3	33 1/3	45.5
4	25	25	50	8.1
5	20	20	60	3.5
2 parts hydrochloric to 1 of nitric:				
6	66 2/3	33 1/3	0	62.0
7	57 1/7	28 4/7	14 2/7	63.5
8	50	25	25	44.0
9	40	20	40	19.5
10	33 1/3	16 2/3	50	8.2
1 part hydrochloric to 2 parts nitric:				
11	33 1/3	66 2/3	0	46.8
12	25	50	25	34.3
13	20	40	40	13.3
14	16 2/3	33 1/3	50	7.3
3 parts hydrochloric to 1 part nitric:				
15	75	25	0	59.8
16	60	20	20	64.5
17	50	16 2/3	33 1/3	25.7
18	42 6/7	14 2/7	42 6/7	19.8
1 part hydrochloric to 3 of nitric:				
19	25	75	0	26.7
20	20	60	20	38.5
21	16 2/3	50	33 1/3	22.0
22	14 2/7	42 6/7	42 6/7	9.5
4 parts hydrochloric to 1 part nitric:				
23	66 2/3	16 2/3	16 2/3	64.3
24	50	12 1/2	37 1/2	17.5
5 parts hydrochloric to 1 part nitric:				
25	71 3/7	14 2/7	14 2/7	63.8
26	55 5/9	11 1/9	33 1/3	47.0

These combinations do not in the least exhaust the possibilities; but they are interesting in showing a wide range of results, and in suggesting the possible things that might be brought out in further experimentation.

The reader should run his eye down the last column, which gives the per cent of platinum dissolved. Picking out the four highest figures we find experiments

7, 16, 23 and 25, in which 63.5%, 64.5%, 64.3% and 63.8% of the metal, respectively, were dissolved. It will be seen that in all of these (a) there is between 14% and 20% of water, and (b) there is considerably more hydrochloric than nitric acid.

Then if he will pick out the five lowest figures, Numbers 4, 5, 10, 14 and 22, in which from 3.5% to 9.5% of the metal was dissolved, he will find that (a) in all of them there is 42% or more of water, and that (b) there is considerably less hydrochloric acid than before.

Each curve describes the action of mixtures having the proportion of acid to acid the same, while the quantity of water varies. It will be seen that the curve is high where the percentage of dissolved platinum is high, and that the curve goes down when much water is added. In three cases it is shown that the greatest solution takes place where there is a little water—less than 20%. This is quite in accord with chemical theories. It will also be seen that in those mixtures where the proportion of hydrochloric acid is high, there is more platinum dissolved than when it is low, comparing mixtures with equal proportions of water.

CONCLUSIONS.

It will be seen that when it is desirable to dissolve platinum readily, as in some kinds of refining, and when "cutting down" metal for solutions, a mixture containing about 4 parts of hydrochloric acid to one of nitric, plus a little water, is recommended. (Of course heating the solution increases the action.) In that case of refining mentioned in the first part of the article, where the object is to dissolve the gold that is mixed with the platinum, it would seem that, oddly enough, about the same mixture should be used, even though in this case the worker is not anxious to dissolve platinum. He will use considerably more hydrochloric than nitric acid in order to avoid an excess of the nitric; he will not use very much water because he does not want his solution to be bulky; and still he will use a little water so that his silver chloride will not dissolve. Therefore the proportions will probably be: 3 or 4 parts hydrochloric, and 1 part each of nitric and water. These are numbers 16 and 23 in the Table.

A PLATER'S RECOLLECTIONS

SOME SERIOUS INFORMATION REGARDING THE FINISHING OF METALS TOLD IN BREEZY STYLE.

BY JOSEPH BIRBAUM*

On a clear sunny day in the month of March, 1896, a poorly but neatly dressed lad stood in front of a factory show window and longingly gazed at the displays behind the heavy plate glass. Ah! how the rays of the sun sparkled among those brilliant objects, hopping from a heavy silvered and gilded loving cup to a row of nickeled faucets, playfully skipping on to a miniature statue of Napoleon as if they were bent on blinding the little corporal, and finally running up to a pair of skates, pointing them out coaxingly to the youngster. Oh! what a difference there was between those skates hanging there and the old rusty ones which he called his own. If—if he could only do such work how he would have it over the other kids!

Slowly, his mind wandered back to the past winter and he saw himself flying over the smooth silvery ice of the pond, his skates shining just like those hanging there in the window. Then he saw Charlie, his best chum, come up to him. "Gee whiz, Joe, where did you get the new skates?"

"Them's not new, I only plated my old ones."

"You did; will you fix mine up, too?"

"I don't know whether I dast," said Joe, "but I'll try to do it for——"

"Good afternoon, Joe, what are you dreaming about?"

It was one of his former school teachers who had observed his dreaming for several minutes and brought him back to the sunshine of the early spring with his greeting.

"If you were going to learn a trade, what would you like to be, president of the republic or president of some national bank?"

"No, sir, I was thinking of learning to be a plater first and maybe later on I'll be able to hold a job as president or director of some bank. This firm here advertised for an apprentice and——"

"Yes, and you haven't the courage to go in and ask for the position. Make up your mind, Joe, to give them or no matter who employs you the best that is in you and you will not have to be afraid to ask for a job, so just walk in, my good boy. Good-bye and good luck to you in all the stages of your future life!" A few minutes later Joe entered the private sanctum of Mr. Paravicini, head of the firm of Paravicini and Waldner, advanced to the desk at which a bald-headed and bewiskered man was busily engaged in looking over some blue prints. The boy very courteously but timidly bid him good afternoon and handed him a clipping of a newspaper.

"Sir, I have come to answer this advertisement."

Mr. Paravicini took the clipping and read, "Wanted—A bright boy to learn the polishing and plating of metals. Apply in person. Paravicini and Waldner, Petersplatz, No. 3."

He closely scrutinized Joe from head to foot and his clear blue eyes searched the boy's face trying to read his character and possible abilities. "Young man, I don't think you are quite strong enough to fill this position. Don't be fooled by the brilliant appearance of the articles displayed in the windows. The work is by no means as clean and easy as you might think still, how is your school record and why do you want to go to work so early?"

"I graduated and won a diploma. As for the second question, you see my father died when I was eight years old and my brothers and sisters have supported me so far. It's not because they are tired of doing so, but I am. I feel strong and big enough to go out and earn my own living or, at least, learn to do so. Won't you give me a chance?"

In answer Mr. Paravicini called one of the office boys and told him to ask Mr. Hoehn to send one of his men to him at once and to send a polisher. Then he again turned towards Joe, his eyelids gradually narrowed as he watched the boy nervously turn his fedora 'round and 'round and he finally exclaimed to himself, "Well, we shall see."

In due time the object of his thoughts or his last

*Foreman plater, Milwaukee Stamping Company, Milwaukee, Wis.

trump card, whatever it may have been, arrived in the form of a big, black, greasy-looking object, whose cap, hair and jacket was covered over with white lint. A short leather apron was strapped around his barrel-sized waist and to this apron clung about a half-inch of thick oily, earthlike substance. Joe was awe-stricken as his first impression had been of standing face to face with a real live big black Nubian that looked just like some of those he had seen in pictures.

"Mister Paravicini, Mr. Hoehn sent me here to report to you," boomed out a deep bass voice from this specimen of a walking mountain of oil, grease and dirt.

"All right, Fritz, this young man here wants to learn the polishing and electro-plating trade and I just want to show him the contrast between the producer and the product. You may go now." Performing sort of a dervish whirl and humming a happy air Fritz beat it to report to the gang that another "victim" had arrived.

"Well, young man, are you still willing to learn this trade, eh? We had two boys change their minds after they were a couple of days in the factory and I'd rather have you change your mind now."

Joe's thoughts were in a wild chaos, for in rapid succession bald heads, red beards, black faces, rusty faucets and nickeled skates passed through his mind, and the shiny skates won. "Yes, sir, I would like to learn to be a plater. I don't care if I get dirty, soap will take it off again, and as long as I have a chance to make good I am satisfied."

"Well and good; we will give you the chance. We consider our plater equal to the best in his trade, but we won't close any contract as yet. You will go on two weeks' trial and at the expiration of that period you, as well as we, are at liberty to withdraw. However, after two weeks a contract will be drawn up. Please tell your mother we wish to see her in regards to the contract."

"Shall I start tomorrow?" asked Joe.

"No don't start tomorrow," replied Mr. Parivicini, "today is Thursday and you had better take it easy the rest of the week. Monday morning at 7.00 a. m. report to Mr. Petit, our superintendent, who will take you to Mr. Hoehn, foreman of the polishing and plating department."

Monday morning Joe was one of the first to enter the gate, but not knowing where the superintendent's office was located he posted himself at the factory entrance expecting to see the superintendent there. Like the giant mouth of some insatiable moloch, this entrance soon commenced to swallow up a mass of human beings, both boys and girls. Some whistling and laughing and others sad-faced, and then some men in the prime of their lives, who felt competent to conquer the world and older ones whose facial expressions betrayed that they had given up all hopes for advancement, all hopes for a peaceful sunset in life and so on all hurried past him into this big factory. Then the factory whistle blew and gave the signal to let loose a shrieking noise, a humming, clanging banging, roaring, pounding and hammering of machinery. To Joe it seemed as if hades itself had been let loose upon him; he, who always roamed in the open and who was not yet used to this seemingly ear-splitting racket.

"Here, Mr. Hoehn, is our aspirant who is after the laurels of your art," said the superintendent as he brought Joe into the plating department. "Let's hope he lives up to your expectations."

"All right, Mr. Petit, we will soon find out. Now come here, my lad, Mr. Paravicini says that you seem to be a brave young man, so don't get discouraged when you get black and greasy from that buff or polishing wheel, and don't throw up the sponge when the potash or vienna lime softens your fingers. Remember, you are learning a trade which positively cannot be replaced by machinery. It is hand labor in our trade and no machine will ever take your job (what an ironic incident it was when Joe years later convinced his former master and teacher the wrongness of this statement), so you just look around for today. Don't touch any machines unless you are told and instructed. You might have to run some errands and also clean up a little."

At 9.20 a. m. the gang, which consisted of eight polishers, four platers' helpers or, as the polishers termed them, "brush-pushers" and one roustabout washed their hands very carefully. This rule was strictly enforced in the plating room on account of some careless worker losing his life some years ago through poisoning. They then proceeded to lunch with rather undue haste. However, Joe soon found out what the reason was for this haste, for while one watched for the foreman the others placed an old glue pot on Joe's head, two brass tubings in his hands, set him on top of a box and he was then charged with the spirit and initiated into the first degree of the noble order of the "Shiners."

The first few days went by slowly, although they were livened up at times by being sent to get a round square, strap oil, solid copper, pure silver anodes or dynamite with which to charge the dynamo, but Joe would not complain and soon he won his way into the heart of all, especially big fat Fritz. The two weeks' trial past, and a trial it was, and then a contract was closed which called for four years' service. In the third year of service one and a half days each week were set aside to attend chemical instruction at the trade school, the time and expense of which was to be borne by the employer. A princely salary of $1.20 per week, which consisted of fifty-nine working hours, was to be paid the first year and which was to be increased twenty-five per cent each succeeding year.

Joe was also given a book of factory and safety rules and which included information such as, no belt was allowed to be thrown on while the transmission was in motion; all danger points must be properly guarded to the utmost possibility; no machine was allowed to be tampered with or to be touched if not engaged in operating same. If a machine was considered unsafe the worker was not to take any risk, but was to report at once the condition of same to his foreman; cleanliness, wherever possible, and observation of carefulness and report of carelessness on the part of a fellow worker was demanded.

The American manufacturer is getting to see into the old proverb that an ounce of prevention is cheaper than a pound of cure. Today he is safeguarding and instructing his workers, wherever he can, in the same way as Joe was when he entered his apprenticeship. With perhaps one or two exceptions only so-called minor accidents occurred during his time in this factory and most of them happened on account of "monkey work," as laws and rules seemed to be made to be violated just as much as they were to be observed. The writer does not entertain the thought that the workers are entirely to blame for accidents, but a good many of them are, and much misery could be avoided if they were to hold themselves strictly to safety rules.

(To be continued.)

EDITORIAL

OLD SERIES
Vol. 22. No. 7

NEW YORK, JULY, 1916

NEW SERIES
Vol. 14. No. 7

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS.
Published Monthly

Copyright 1916 by
THE METAL INDUSTRY PUBLISHING COMPANY
(Incorporated)

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, $1.00 PER YEAR, POSTPAID TO ANY PART OF THE WORLD. :: SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order : Cash Should Be Registered

ADVERTISING RATES ON APPLICATION
FORMS CLOSE THE FIRST OF THE MONTH

Palmer H. Langdon - - - - - - - - - Editor and Publisher
Louis J. Krom - - - - - - - - - - - Managing Editor
George W. Cooper - - - - - - - - - Advertising Manager
Thomas A. Trumbour - - - - - - - - Circulation Manager

ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK.
Telephone Number John 689 Cable Address, Metalustry

CONTENTS

	Page
American Electro-Platers' Society Convention	279
Nickel Anodes	284
Magnesium Sulphate	287
Metallurgy of the Rarer Metals	289
The Casting of Metals in Chill Molds (Concluded)	290
Muntz Metal	292
The Manufacture of Detonating Fuses for High Explosive Shells	293
Solution of Platinum in Aqua Regia	296
A Plater's Recollections (Continued)	298
Editorials:	
Effect of Cadmium on Brass	300
Common Sense in Galvanizing	301
Electro Platers' Convention	302
Correspondence:	
Electric Furnaces	302
New Book:	
Cost Accounting	302
Shop Problems	303
Patents	305
Equipment:	
D. C. Motors of the Lower Horse-Power	307
L. & A. Electric Vibrator	308
Water Seal	308
Newman Machine Attachments	308
High Speed Compound Buffing Lathe	309
Tirrill Gas Fire Pot	309
Carlsruhe Cleanser	309
Associations and Societies	310
Personals	312
Trade News	312
Metal Market Review	320
Metal Prices	321

EFFECT OF CADMIUM ON BRASS

While this question has not been made the subject of very exhaustive researches by manufacturers of copper alloys and very little appears in scientific publications relating to it, at the same time it has been the cause of considerable discussion among metal users. The results of what might, at the present time, be called incomplete investigations indicate that cadmium when present in spelter in amounts of over 1 per cent. would be detrimental to the manufacture of high class brasses such as are used for cartridge metal or deep drawn stock.

In quantities less than the amount given above, however, personal experience has proved that cadmium need not be considered as having injurious effects on brass mixtures. As a matter of fact, the difference in volatilization points of cadmium and zinc plays a most important part in the reaction which takes place when the metals are introduced into a pot of copper at a temperature of 1100° C. or over. Zinc melts at 415° C. and boils at 940° C., so its volatilization point may be taken at somewhere near its boiling point. Cadmium melts at 320° C. and boils at 778.6° C. Therefore, it will be seen that there is sufficient difference between the two so-called volatilization points so as to enable a separation to be made of the two metals by heat, and as a matter of fact this is done in the production of cadmium, per se.

This difference leads to the logical conclusion that cadmium will oxidize at a lower temperature than zinc, and this is a fact. So it might be said, with entire accuracy, that in using a spelter containing an amount of cadmium up to 1 per cent. that this cadmium will act as an deoxidizer on the copper and form CdO or cadmium-oxide and come to the top of the pot of metal before the zinc performs the same office, and it is within the limit of our experience that upon analysis of such metal made with a zinc carrying cadmium, that no cadmium was found in the brass so made.

Of course, cadmium that might remain in the brass and exist as a cadmium-copper alloy or cadmium-zinc-copper alloy would cause the resulting brass to be brittle and would not admit of the malleable properties that are required in commercial brass.

George C. Stone, of the New Jersey Zinc Company, in a paper read a year ago before the American Institute of Metals on "Zinc for Slush Mold Castings," made the statement that cadmium in even very small amounts rendered the zinc unfit for such castings, as cracks and brittleness were very prevalent. This is very easily explained and is entirely different from conditions existing in making brass with a zinc carrying cadmium. In making slush mold castings, of course, only zinc is used, and the temperature is therefore not much above the actual melting

point of zinc, consequently the cadmium in the zinc does not have any opportunity to volatilize and is to be found in practically its original proportion in the resulting casting and therefore has the detrimental effect described by Mr. Stone.

Now in the case of brass we first melt copper at a temperature of approximately 1100° C., and into this then we introduce the zinc which melts at 415° C., and as there is every chance for the cadmium to volatilize and oxidize, consequently our cadmium, as said before, is removed in this way.

As a summary, then, of what is said above, it is the writer's experience that cadmium in zinc in amounts anywhere up to 1 per cent. is not at all prejudicial for the use of such zinc in the manufacture of brass. Just what the actual effects are from cadmium in amounts higher than 1 per cent. we are not prepared to state authoritatively, but it is our opinion that attempts to make anything but what is known as leaded brasses, which are those containing an intentional amount of lead, would meet with failure.

COMMON SENSE IN GALVANIZING.

The unusual number of inquiries received at the office of THE METAL INDUSTRY relating to proper methods for "galvanizing" or coating with zinc, iron and steel articles of every description indicates very clearly the effects upon the galvanizing industry of the continuous high price of spelter. The ordinary hot galvanizing process, which consists in dipping the article to be coated into a bath of molten metal can be uniformly and systematically carried on by employing the brand of spelter known as Prime Western.

This spelter according to the standard of composition adopted by the American Society of Testing Materials embraces a range of from one to one and a half per cent. of impurities. The small amount of impurities which this grade of spelter will be found to contain, consisting of iron, lead and cadmium, will not as a general rule have much effect on the quality of the coating. While it is true that a cadmium content above one per cent. is liable to cause the coating to harden and therefore is one of the reasons for excessive peeling, yet it is deemed that under good temperature conditions even this amount of cadmium will not have bad effects.

If, however, as we suspect, the principal reason for the large number of requests for help that are being received is due to an attempt on the part of operators to employ a cheaper and therefore more impure brand of spelter, the problem becomes rather a difficult one. Nine-tenths of the inquiries that come in do not state just what brand of spelter is being employed and then, of course, the expert who endeavors to set the inquirer right must either assume that any one of a number of causes is the real one and proceed to solve the problem along these lines or he must correspond for further data and information, thus causing a delay that is sometimes not only annoying, but financially disastrous.

It is with the idea in view to give our readers a fairly clear idea of what should be done in the operation of an ordinary galvanizing tank that we have evolved these few remarks. The element of common sense injected into the operation of hot galvanizing will eliminate practically ninety per cent. of the trouble that is experienced by a great many operators and the remaining ten per cent. may be set down to the attempt to use an impure or too low grade of zinc. There are, of course, three essentials in the operation of the galvanizing tank. First, proper condition of the material to be coated, meaning its cleanliness and preparation by means of a flux to take its new coat of metal. Second, the employment of the proper quality of spelter which, as told above, should be one containing not over one and a half per cent. of impurities. Third, the temperature at which the molten bath is worked.

As probably all persons who are interested in hot galvanizing are familiar with the proper methods of the work for treatment it is not deemed necessary to set it forth here. The second factor necessary to succeed in galvanizing; the selection of the proper spelter has been covered above, so we come to the third factor, that of temperature and the following instructions will be found advisable to observe. Different kinds of work require different temperatures of the molten bath and, as said above, common sense backed up by experience is the most important factor in determining what this temperature should be. In a general sort of a way W. T. Flanders in his recent work on "Galvanizing and Tinning" gives a few temperatures which may be taken as authoritative. He says:

"Large gray iron castings require that the metal be at the lowest temperature possible and still have it liquid. At about this temperature it will be silver white in color, will burn sal ammoniac slowly when thrown on its surface, and when a skimmer is passed over its surface the oxide will be slow in appearing. With the metal in this condition the pyrometer should indicate about 800 degrees of heat. This temperature is also suitable for galvanizing very thin castings that are intended to be 'spangled' or to have a crystallized appearance—for example, sinks and like work.

"For work that is drawn through the clear metal the pyrometer should indicate not less than 850 degrees. At this temperature the metal should have a slightly bluish cast, burn sal ammoniac moderately quick and show the oxide in a few seconds after the skimmer has been passed over its surface. This temperature is about right for galvanizing wrought iron pipe, the cheaper grades of sheet iron and goods made from it, such as coal hods, ash cans and chamber pails. Heavy malleable iron castings will also coat nicely at this heat.

"For small work, such as nails, and in fact, almost any work that is done in baskets or strung on wires and drawn through flux, the pyrometer should indicate not less than 900 and not more than 925 degrees Fahr. The metal at this heat should burn sal ammoniac quickly and oxidize quickly, and will be quite blue in color. This temperature is about right for sheet steel and articles made from it, as well as steel pipe"

Our advice then for the successful operation of a galvanizing tank to those who are either new in the business or who are making experiments with a view of cutting down the operating expenses is first, select a brand of spelter that has been known to give good results for

galvanizing and stick to it as closely as is possible; second, employ a pyrometer and get the various degrees of temperatures and the conditions and appearance of the metal firmly fixed in the minds of the actual operators of the tank and finally to follow the instructions laid down by Mr. Flanders and we have no doubt but that vexatious and expensive shortcomings in galvanizing will be overcome.

ELECTRO-PLATERS' CONVENTION

Another convention has come and gone and history has been made. It is only to be expected that the officers and members of committees of the American Electro-Platers Society should feel more or less elated over the success of their efforts. They have every right to be and they surely deserve the thanks of all who shared in any way in the good things that the convention in Cleveland, July 6 to 8th, provided. If a delegate craved pleasure he got it in the trip and the joy of being with his fellow platers. If he wanted information relating to his work, whether it was the answer to some vexing problem or whether it was in the form as to what was new in plating he got that too. The first was obtained while in attendance at the more serious side of the occasion, the business sessions, while the second was furnished by the interesting display of exhibits. These it will be seen by reading the list of EXHIBITORS and EXHIBITS in the opening article in this issue of THE METAL INDUSTRY, covered about every thing in the field of endeavor devoted to the furnishing of metals.

We have no doubt whatever that when the bulletins of the Society appear containing the subject matter of the papers read and discussed every one of the 618 members will feel that he has received more than the cost of his membership. This opinion is strengthened considerably by the study of the one paper presented at the convention that we are permitted to publish. Anodes, by F. J. Liscomb, published in this issue of THE METAL INDUSTRY is a good paper. It is clear and concise in its make up and convincing in its statements. We congratulate Mr. Liscomb for having written it and the Platers Association for the possession of it for their records and also in the membership of the author.

The pathetic incident of the delegate from Milwaukee, who was prevented from attending because of cyanide poisoning will we hope be fruitful of very good results. Now that the Bureau of Standards at Washington, D. C., and through them the Government Board of Health has become interested we believe that some recommendations for relief will be had before long. This matter properly belongs to the realm of plating room sanitation and we do not know of any better hands in which to leave the matter. Meanwhile the work that the Society itself is doing in the educating of its members as to the characteristics of the chemicals they use, will go a great way towards eradicating the disagreeable and sometimes dangerous maladies that now and again afflict the worker in the plating room.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY.

ELECTRIC FURNACES

TO THE EDITOR OF THE METAL INDUSTRY:

We duly received your favor of April 11 and have also read the article published in your April issue by W. H. Parry, and in reply wish to state that if Mr. Parry had had any practical experience with the operation of electric furnaces, he would never have written the article. He also seems to understand very little about the very high expenses connected with the introduction and marketing of a patented article of this kind.

Fortunately we have met with very few people that take the same view as Mr. Parry, and we are pleased to inform you that we have sold four furnaces in the United States and eight abroad during the past four weeks.

This makes fifty-four Rennerfelt furnaces contracted for or in operation, of which twenty-one are building.

HAMILTON & HANSELL.
J. W. H. HAMILTON.

New York, April 17, 1916.

THE METAL INDUSTRY wrote to a number of the firms whose names were given by Messrs. Hamilton and Hansell and only one reply was received, which was as follows:

THE METAL INDUSTRY, NEW YORK.

Gentlemen—Referring to your favor, we beg to say that we have used the electric furnace for the purpose of melting cast iron, but we have not found the results economical or in any way satisfying. We are now preparing for using the furnace for cast steel melting, but the matter is still in a preliminary state.

As to the fitness of the furnace for brass melting we are quite without any experience.

Pr. Pro. DRAMMENS JERNSTOBERI & MEKANISKE VARKSTED.
J. RENGTHAR.

From the above it would appear that Mr. Parry was not very far wrong in his statements.—Ed.)

NEW BOOKS

COST ACCOUNTING—THEORY AND PRACTICE. By J. Lee Nicholson. Size 6½ x 8½ inches. Bound in boards half leather. 340 pages, including index. 70 illustrations. Published by the Ronald Press Company. Price $4.00. For sale by THE METAL INDUSTRY.

In publishing this work the author's idea has been to furnish a work that will first provide for the public accountant and cost accountant a reference book dealing in a direct manner with the practical parts of cost accounting. Second, present the principles and methods of cost accounting in a simple and direct manner, so that the student may be able to grasp them quickly, unhampered by dissertations on organization, efficiency and the importance of cost accounting generally and furnish the manufacturer with a work containing all the important practical points in connection with cost accounting, summarized and briefly explained.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE.

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

CLEANING

Q.—We are attempting to clean some wires made of hard Bessemer steel for brass plating and are cleaning them by dipping in muriatic acid. We have also tried cyanide, but with all the cleaning solutions we have tried there is a black coat which appears to be a black oxide left on the wires, which prevents us from obtaining a nice brass plate. Can you inform us what to do to overcome this difficulty?

A.—We presume from your question that your trouble is due to carbon upon the steel which is caused by the oil tempering. If this is so then no acids will remove the black coating because carbon is insoluble, and mechanical methods perhaps are the only way to help you out of your difficulty.

If possible tumble the steel wires in silica sand and water and to each gallon of water add 1 to 2 ounces of sodium carbonate. In a short time you will be able to produce a clean bright surface to your steel that can be plated without any difficulty. The articles should be tumbled from thirty minutes and longer, if necessary.—C. H. P. Problem 2,317.

FINISHING

Q.—Would be pleased to have you advise how to obtain a green smut finish on gold jewelry. I have used a green gold solution in which I have put potash, but I did not get good results. Then I used potash and arsenic, but obtained a black smut instead.

A.—To produce a greenish smut such as you require the best material to add to the green gold solution would be lead in the form of acetate of lead. Dissolve one ounce of the lead acetate in six ounces of sodium hyposulphite in one pint of water. Boil for a short time and then strain or filter the solution.

Afterwards add very small proportions of the lead solution to the green gold, only a few drops at a time until the color is all that is desired and note the amount you have added and you can repeat the addition at any time. Arsenic produces a blackish green, but is useful for some purposes.—C. H. P. Problem 2,318.

INKING

Q.—Kindly advise how to ink brass before lacquering so that the lacquer can be removed from the surfaces where it is not wanted. Also the composition of the ink and how to apply it to the brass.

A.—There is a printer's ink being used by some concerns for etching known as metal worker's ink, but where lacquer is applied to the surface of the brass and afterwards used an asphaltum ink would be the material to use or an air drying japan.

The ink can be prepared by dissolving ground Egyptian asphaltum in benzine or turpentine until a fluid ink is prepared, although if benzine is used alone it will dry too fast and a little Venice turpentine incorporated with it would produce a better product. There are also some paraffin combinations that might be used for the purpose.—C. H. P. Problem 2,319.

JAPANNING

Q.—I would appreciate your opinion as to the method used in obtaining a black finish like that on the dress fasteners enclosed, which are of European manufacture. I have been unable to find any one who knows just what substance is used to obtain this finish and I have tried japanning but the phosphor bronze spring becomes baked to the brass shell. I have also tried Egyptian lacquer but it gums up the spring. By plating the fasteners I obtain a blue black finish, but the spring does not become finished.

A.—From a test made of the finish on the fasteners manufactured in Europe it is apparently a japan and produced by the tumbling method. To avoid an excess of japan upon the articles it is customary to dip them bright by the aid of the usual acid mixtures of sulphuric and nitric acids and finally color them black in an ammonia copper carbonate solution. This solution consists of 1 gallon of water ammonia (26 per cent.), 1 pound of copper carbonate, 1 pint of water and 2 ounces of soda ash. The temperature should be from 140 to 160 degrees. After the articles become black they should be removed, washed and dried and then very lightly japanned by the tumbling method.

In Germany the following solution is used for producing bright black deposits upon brass by immersion in a boiling solution of not less than 200 degrees Fahr. The black color is hard and durable and if the articles are bright before immersing in the solution the black deposit will be bright. The solution is as follows:

Water	1 gallon
Caustic soda	8 ounces
Potassium persulphide	1 to 2 ounces

Time of immersion should be from 5 to 10 minutes. The black forms slowly but is hard and durable. On account of the European situation it may be difficult to procure the potassium persulphide.

Another method worth trying out is a special form of black nickel solution used in a small tumbling barrel such as is used for regular nickel plating. The solution may be used at a temperature of 100 degrees with nickel anodes.

Water	1 gallon
Double nickel salts	¾ pound
Soda ash	1½ ounces
Sulphate of zinc	1 ounce
Ammonium sulphocyanide	1 ounce
Benzoic acid	1½ to 2 ounces

To prepare the black nickel solution, first dissolve the nickel salts, soda ash and sulphate of zinc in a half a gallon of hot water (160 to 180 degrees). When the materials are all dissolved then add the sulphocyanide of ammonia and benzoic acid, with constant stirring, and the solution will be ready for use. This solution should be run with as low a voltage as possible, commence at 3 volts and increase if necessary, but the lower the voltage the more intense black will be obtained. A thirty-minute deposit will be ample. The deposit does not require to be lacquered, but should be carefully dried out to prevent staining. —C. H. P. Problem 2,320.

MIXING

Q.—We have a babbitt formula as follows: 74 of lead, 16 of tin, 8 of antimony and 2 of copper. From a metallurgical standpoint, do you believe that this specification contains a surplus of copper; or, in other words, would the copper in this formula cause the metal to be sluggish?

A.—The amount of copper in your formula will not cause the mixture to be sluggish. You can either incorporate the small amount of copper into the bath by using copper shavings or you may use a copper-tin alloy which may be made up first.—K. Problem 2,321.

Q.—Will you kindly publish a mixture for phosphor bronze which will be very strong and tough? The sample of metal which I wish to match gives long spiral turnings from 6 to 12

inches long. I require a mixture of metal which will give similar turnings when it is machined.

A.—The following mixture gives a tough, strong phosphor bronze:

Copper	96 per cent.
Tin	3¾ " "
Phosphorous	¼ " "

A half-inch diameter rod made from this mixture will have 85,000 tensile strength and 25 per cent. elongation in 2 inches. By drawing or cold rolling, greater strength may be obtained, but the ductility is lessened.—J. L. J. Problem 2,322.

PLATING

Q.—We are frequently called upon to handle small orders of copper and nickel plating for various outside concerns in our vicinity. We have never made a business of plating and handle these orders merely as a matter of courtesy to the other industries in town and have had no experience in the setting of prices for such work. We would appreciate it very much if you could advise us upon what basis charges for plating of this kind are based and about what such prices should be.

A.—It is customary to add 100 per cent. to the cost of labor for polishing and plating operations. This 100 per cent. will take care of incidentals, materials used and give a profit on the labor investment. If you will figure on this basis you will find the estimate nearly correct.—C. H. P. Problem 2,323.

Q.—Would you kindly advise if there is any way that copper can be plated directly on a mirror that has been made by a chemical deposit of silver. I have used the varnish and bronze powder and have had good results, but I wish to plate direct on the silver lacking if possible.

A.—The following formula is being used for giving mirrors a copper deposit after silvering, and has been found to give excellent results:

Water	1 gallon
Copper sulphate	1 ounce
Rochelle salts	1¼ ounces
Ammonia water	⅛ ounce

Anodes of copper with 2 volts pressure should be used.—C. H. P. Problem 2,324.

PLATING

Q.—We are installing an iron tank 13 x 3 x 7 feet, in which we desire to brass plate in one operation two hundred steel rods, weighing about eight hundred pounds and several problems arise, some of which we are in doubt as just the best method to follow.

First—Do you think it necessary to line this tank—for some reason or other the insulating might become disarranged and current pass into the shell of the tank? Would we not be apt to plate iron off the inside and thereby spoil our solution? There is also a possibility of one or two of the rods dropping off the hanger and making a contact.

Second—What would be the best style of dynamo and how many amperes are necessary? It is our desire to plate these rods not over thirty minutes, possibly twenty, but there has to be sufficient brass on the rods to permit being highly colored on the buff wheel.

Third—We have been using cast brass anodes, made from scrap metal, and sometimes we have considerable trouble with the work coming out of the solution with dark streaks or blotches, some with a muddy appearance and others with a gray tinge. Our plater claims that the trouble lies with the anodes and not with the solution and points to the fact that he does not put in a particle of zinc and has not put any in for months, although he can put in all the copper he wants without any perceptible change. In fact, he states that he has put in enough copper to practically make it a copper solution. For your information we brass plate in these solutions hollow steel tubes from ⅜ to 1 inch in diameter and from 30 to 50 inches long, immersing them lengthwise.

A.—It is not necessary to insulate the inside of an iron tank, but the following precautions should be taken: A wooden lining ½ inch to ⅝ inch thick should extend on two sides of the tank at least 6 inches below the anodes. This wooden lining prevents polarization between the anodes and the tank. If steam connections are used then the regular insulators provided for the purpose will prevent the flow of current through the pipes. Such insulators may be procured from any of the plating supply concerns. Rubber hose may be used to break up the continuous metal contact of the pipes. The proper insulation of the anode and the cathode rods from the tank must be looked after and hard wood or fibre is frequently used for this purpose. Iron is not soluble in cyanide solutions, so no detrimental effects can ensue from using such a tank as far as the solution is concerned.

If the rods dropped to the bottom of the tank free from the supporting frame or hanger no difficulty would ensue, but if only one end dropped to the bottom of the tank and the other remained upon the frame there would be danger of short circuiting between the frame and the tank. This might possibly burn out your dynamo. A wooden lining inside the entire tank or a cement one would prevent such a thing happening.

It is difficult for us to decide just which type of dynamo will answer your purpose best, but should be one having the following capacity: 6 volts and 1,500 to 2,000 amperes. With the correct solution it should be possible to plate such rods in twenty minutes.

The trouble you experience may be due partly to the anodes and partly to the composition of the solution. It is poor economy to use scrap for anodes. One of the best mixtures for such anodes consists of the following materials which should all be new metal:

Copper	66 per cent.
Western spelter	33 "
Banca tin	1 "

Cast anodes should be given the preference.—C. H. P. Problem 2,325.

SILVERING

Q.—In silver plating brass work which is to stand hard enamel can the ordinary silver solution be used? How long should it be left in the solution and what makes the work come out yellow or burn under the enamel?

A.—The regular silver solution can be used for silver plating brass for hard enamelling and should consist of the following proportions:

Water	1 gallon
Sodium cyanide	2½ ounces
Silver cyanide	2 ounces
Sodium hyposulphite	½ ounce

This solution will contain approximately 1.61 ounces of metallic silver per gallon of water.

The following suggestions should prove of value. First—Use a very dilute cyanide of mercury solution in connection with the plating of the brass so that the silver will not deposit from the solution by reciprocal decomposition for if that occurs the deposit is non-adherent. The slight film of mercury deposited upon the brass by simple immersion in the mercury solution aids in producing an adherent deposit of silver from the silver solution.

Second—Do not use an excess of current. The silver should come from the solution a clear white deposit. Third—Avoid an excess of cyanide to prevent the burning of the deposit. Fourth—Do not use chloride of silver in your solution as deposits from chloride solutions turn yellow due to the chlorine in the solution.—C. H. P. Problem 2,326.

TESTING

Q.—We use a considerable quantity of ammonia and should like to know if there is any simple way of testing this either with a hydrometer or something of that class to show the strength. We are supposed to use 28 degree but unfortunately have not been getting this quality, though we have paid for same.

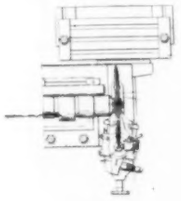
A.—Would advise you to procure a Baumé hydrometer as you will then be able to test the specific gravity of the ammonia you purchase. Baumé hydrometers for heavy liquids register from 20 degrees upwards to 100 degrees; for lighter liquids from zero up to 20 degrees, and for liquids lighter than water, they read downward, water being the lowest point of immersion in such liquids.—C. H. P. Problem 2,327.

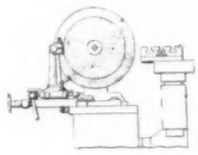
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST.

1,182,321. May 9, 1916. **Grinding Machine.** E. P. Sacrey, Philadelphia, Pa., assignor to W. F. Fischer, of the same place.

These improvements in grinding machines relate more particularly to means for truing grinding wheels, and have the purpose, generally stated, of providing mechanism of simple, accurate, efficient, readily operable, and readily adjustable character adapted for truing the peripheries of grinding wheels of different sizes to desired contours, preferably such that the periphery of the wheel intersects in an arc a plane passed through the axis of the wheel, and facing the wheel's adjacent surfaces to conical or conoidal form.



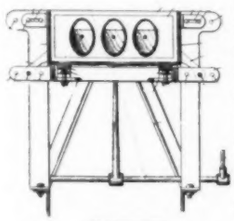


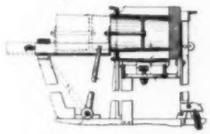
The characteristic construction and mode of operation of the preferred form of the mechanism for effecting the above purpose of the invention, are disclosed in the accompanying drawings in illustration thereof.

1,183,896. May 23, 1916. **Molding Machine.** J. C. Miller, Jackson, Mich.

This invention relates to improvements in molding machines.

The main objects of this invention are: First, to provide in a molding machine an improved tamping mechanism. Second, to provide in a molding machine an improved adjustable mold. Third, to provide in a molding machine an improved mold which may be tilted to facilitate the removal of the molded blocks. Fourth, to provide an improved molding machine, as shown in cut, which is of large capacity, is comparatively simple in structure and very easy to operate. The patent covers:

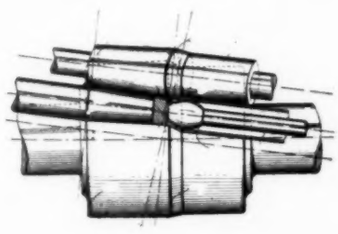




In a molding machine, the combination of a pair of uprights, a plurality of tamping bars, an actuating shaft mounted on said uprights, pairs of cams on said shaft spaced to revolve at the sides of said tamping bars, said cams being provided with hubs constituting supports for said tamping bars, said shaft being disposed so that it constitutes a support for one side of said tamping bars, and rollers on said tamping bars coacting with said pairs of cams.

1,185,270. May 30, 1916. **Seamless-Tube Forming Mill.** Ludwig Wolffgram, Brooklyn, N. Y.

This invention relates to rollers for seamless-tube forming mills, and has for its object to provide rollers specially positioned and configured to carry out a new mode of operation to be hereinafter more fully described.

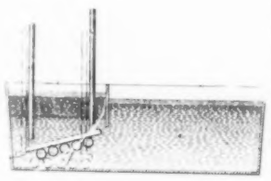


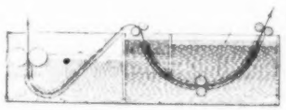
An embodiment of such rollers is shown in the accompanying drawing. The patent covers the following claim. In a rolling mill for rolling thin walled tubes, the combination of two cooperating side rollers of different sizes disposed apart from each other, and having their axes in parallel vertical planes oppositely inclined to the horizontal, and a smaller roller disposed between said side rollers above the centers thereof, and having its axis in a horizontal plane inclined to the vertical planes passing through the axes of said side rollers, said rollers being relatively disposed to form between them an imaginary truncated cone tangential to each of the rollers.

1,184,194. May 23, 1916. **Method of Applying Protective Coatings to Metallic Articles.** Clarence Mark, Evanston, Ill., assignor to Clayton Mark, of Chicago, Ill.

This patent covers:

A method of applying protective coatings to metallic articles, which consists of passing the article to be coated through a molten bath containing lead and zinc, the bath having superimposed upon it, at the point of entrance of the article, a layer of molten zinc, whereby the zinc forms with the article a zinc-iron alloy, thereby providing a base of adhesion for the alloy containing lead and zinc.

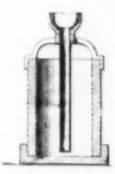




The process of applying protective coatings to metallic articles, which consists in pre-heating the article by passing the same through a molten bath, as shown in cut, and then subsequently passing the article through a second molten bath containing lead and zinc, the bath at the point of entrance of the article being covered with a layer of zinc, whereby the zinc forms a zinc-iron alloy on the article, thereby providing a base of adhesion for the alloy containing lead and zinc.

1,184,523. May 23, 1916. **Process of Casting Molten Materials.** H. E. Field, Wheeling, W. Va.

This is a process which consists in pouring the molten metal or materials through a tube into a mold, as shown in cut, whereby the molten metal is conducted into the mold rapidly and quietly, with the least amount of agitation of the material and with no splashing of the metal or material on the sides of the mold.

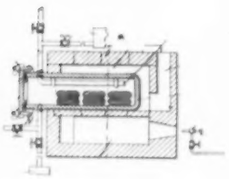


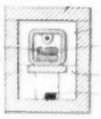
In the ordinary pouring of the molten metal in the mold, the splash of the metal on the side of the mold solidifies immediately and does not dissolve, and when the ingots are rolled, hammered or forged these particles of splashed material form seams and cracks in the finished product. The quiet pouring through a tube, as employed in my process, effects a more satisfactory solidification of the material, and prevents any splash resulting in an article which when rolled is free from seams and cracks.

The improved process may be used with any style or make of ingot or sand molds with large or small tops, or with the various contrivances which are used in connection with such molds to reduce what is known as "piping" in the ingot. This process can be used in the pouring of any molden materials into molds, either aluminum, copper, lead, zinc, tin, antimony or any of their alloys.

1,185,280. May 30, 1916. **Process for Heating and Subsequently Cooling Metal Articles.** Edwin W. Beardsley, of Cheshire, Conn., assignor to American Brass Company, of Waterbury, Conn., a corporation of Connecticut.

This invention relates to a new and improved process of heating and subsequently cooling metal articles, and has for its object to provide for the heating and subsequent cooling of metals such as copper without oxidation or discoloration of the same. It is particularly useful in annealing very fine copper wire. The patent covers:



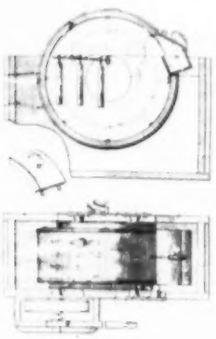


1. The process of treating oxidizable metal articles, which consists in heating them to the desired degree in a chamber, as shown in cut, filled with an atmosphere of steam from an external source, replacing said atmosphere by an atmosphere of non-oxidizing gas, and permitting the articles to cool to a non-oxidizing temperature while in the latter atmosphere.

2. The process of treating oxidizable metal articles, which consists in surrounding them by an atmosphere of steam from an external source while contained in a chamber, applying heat externally to said chamber and thereby raising the temperature of the articles so surrounded to the desired degree, replacing said atmosphere with an atmosphere of non-oxidizing gas, and permitting said chamber and the articles therein to cool to a non-oxidizing temperature.

1,185,946. June 6, 1916. **Plating-Machine.** Louis Schulte, Chicago, Ill.

This invention relates to plating or tumbling machines, and has for its object the provision of means to simplify the insertion and withdrawal of the goods or work from devices such as this where a rotatable barrel is used.

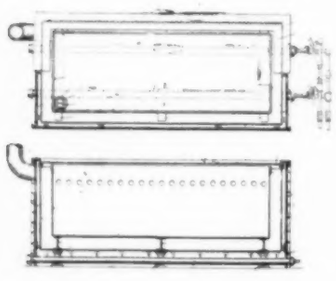


The invention contemplates the provision of means by virtue of which the work may be withdrawn from the barrel, as shown in cut, without removing it from its containing tank, and by virtue of which in its preferred form the work may be withdrawn without reversing the direction of rotation of the barrel.

The invention further contemplates the provision of a structure of use more particularly with plating barrels wherein a large amount of anode surface within the drum may be employed without interfering with the goods to be plated, the structure being such that the drum itself need not be perforated, thus materially reducing the cost of construction. It is readily apparent that if a sufficient amount of anode surface be provided within the drum that the perforations need not be present as no anodes need be employed exteriorly of the drum.

1,185,343. May 30, 1916. **Tank for Rust-Proofing Metals.** Wyman C. Parker, Detroit, Mich., assignor to C. W. Parker, Detroit, Mich.

This invention relates to double tanks especially adapted for the treatment of metals by means of acid baths under the influence of sufficient heat to set up currents of the liquids within the tanks, and its object is to provide a double tank wherein the liquid may be heated in an outer receptacle, and then flow into an inner receptacle without agitating any deposits or precipitates in such inner receptacle.

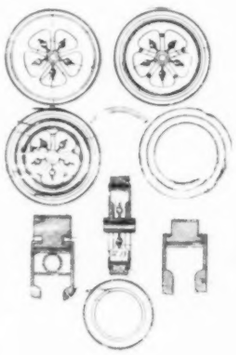


This invention consists of a plurality of receptacles, as shown in cut, one within the other and spaced therefrom, the bottom and lower portion of the inner receptacle being imperforate, and the height of the liquid in the outer receptacle and the construction of the inner receptacle being such that the heated liquid may circulate freely from one receptacle to the other.

It further consists in supplying the inner receptacle with a discharging device to permit the decanting of the contents of the inner receptacle down to a certain predetermined level.

1,186,058. June 6, 1916. **Polishing Wheel.** E. D. Woods, Hartford, Conn., assignor to New Products Company, of the same place.

This invention relates to an improved polishing wheel having an annular rim supported on a spiral spring band whereby a resilient action is imparted to the rim under the polishing pressure. The patent covers the following claims:



A polishing wheel comprising an annular detachable rim, as shown in cut, adapted to carry abrasive material on its periphery, a spiral spring band underlying the rim and in constant elastic contact with the interior circumferential surface of the rim, side plates freely embracing the edges of the rim and spring band.

A polishing wheel comprising an annular detachable rim, a spiral spring band of multiple coils lying against the interior circumferential portion of the rim and in constant elastic contact therewith.

A polishing wheel comprising an annular rim formed of pliable material adapted to carry abrasive material on its periphery, a spiral spring band of multiple coils within the circumferential interior of the rim and in constant elastic engagement therewith, and side plates adapted to permit the inward movement of the rim and limit its outward movement.

1,185,959. June 6, 1916. **Nickel Anode and Process of Manufacture.** James J. Walsh, of Indianapolis, Ind., assignor to the Prest-O-Lite Company, Inc., of Indianapolis, Ind., a corporation of New York.

This invention covers the process of utilizing scrap anodes by means of welding. The claims are as follows:

1. In the art of plating, the process of utilizing scrap anodes which comprises uniting to a support or base anode, a number of scrap anodes by the autogenous welding process, as shown in cut.

2. In the art of plating the process of continuing the life of the anodes by uniting several scrap anodes to one another by a welding process to form a single anode, substantially as set forth.

3. In the art of plating, the process of forming plating anodes from scraps which consists in building up an anode by permanently uniting a number of said scraps directly one to another, whereby a single anode composed of scraps is provided adapted to be supported in the plating bath from one of the original component parts thereof, substantially as set forth.

4. An anode for use in the art of plating, consisting of several scrap anodes, one of which is utilized as a base or supporting part, and the others of which are integrally united thereto, substantially as set forth.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST.

D. C. MOTORS OF THE LOWER HORSEPOWERS

To meet the increasing demand for direct current motors of the smaller horse powers for direct connection and drive of all kinds of industrial machinery, machine tools and the many motor applications requiring a low-power compact motor, the C. & C. Electric & Manufacturing Company, of Garwood, N. J., has developed a new line of motors specially designed for this class of work.

The new motors known as the Type 1B are of bi-polar type with interpoles and can be furnished in rating up to 10 hp. in either the shunt or compound wound. For a general manufacturer's drives, as machine tools and other industrial machinery, the characteristics of the shunt wound motor are the most desirable. It is essentially a constant speed machine, having close speed regulation from no load to full load, and is recommended for all purposes where the torque required for starting and accelerating does not greatly exceed full load

FIG. 1. C & C TYPE I. B. MOTOR WITH UNIVERSAL BASE.

torque. The compound wound motor is desirable for drives where the starting torque is much heavier than the full load torque. This motor starts at a much heavier load than the shunt wound motor and any degree of compounding can be furnished to meet conditions. Adjustment of the speed is obtained in both cases by either armature or field control.

The materials entering into the manufacture of these motors are the best obtainable to permit the closest limits of design, giving a compact machine, sturdy both electrically and mechanically. The main frames with supporting feet are cast integral and the pole pieces are separate. The main pole pieces and pole shoes are laminated and the interpole pieces are separately cast and the coils are all form wound. The pulley side bearing bracket is provided with a wide apron to protect the winding from mechanical injury and the bearing supported by four arms with large openings between them, makes a rigid open bracket, permitting free and ample ventilation. The commutator side bearing bracket has four arms, giving a rigid bracket and free access to the commutator and brushes. Both brackets fit in a recess in the main frame, insuring perfect and rigid alignment.

The armatures are of standard design with laminated core. An air agitating fan is placed on the pulley side of the shaft, next to the armature winding to furnish the very high degree of ventilation and cooling so necessary in motors of the smaller compact frame and guarantees severe service and heavy overloads. The addition of interior commutating poles completes

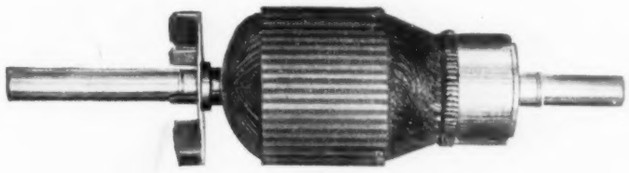


FIG. 2. THE I. B. ARMATURE.

the perfection and the constant characteristics of these motors. They are the latest addition to the well known old standard motors of the C. & C. Electric & Mfg. Co., and it is said that they uphold the long established reputation of sturdiness and perfect reliability of the old line. In continuous operation for long periods, they run cool and without attention. The interpoles insure sparkless commutation through the full range of load without changing the brush position.

The new line of motors is furnished in the open type, or with

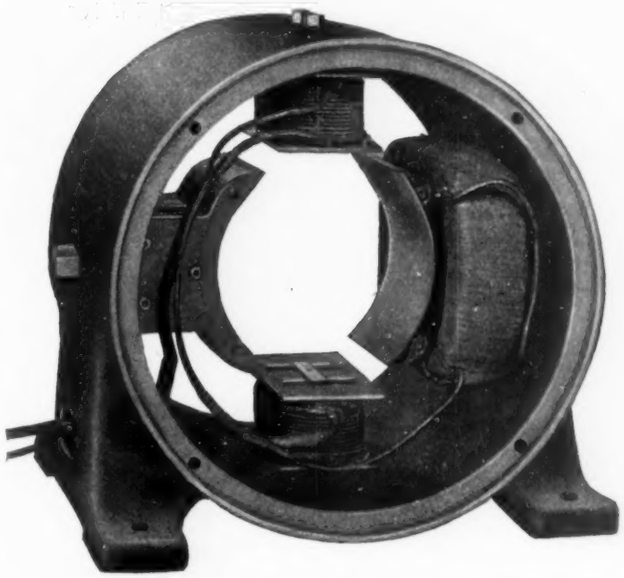


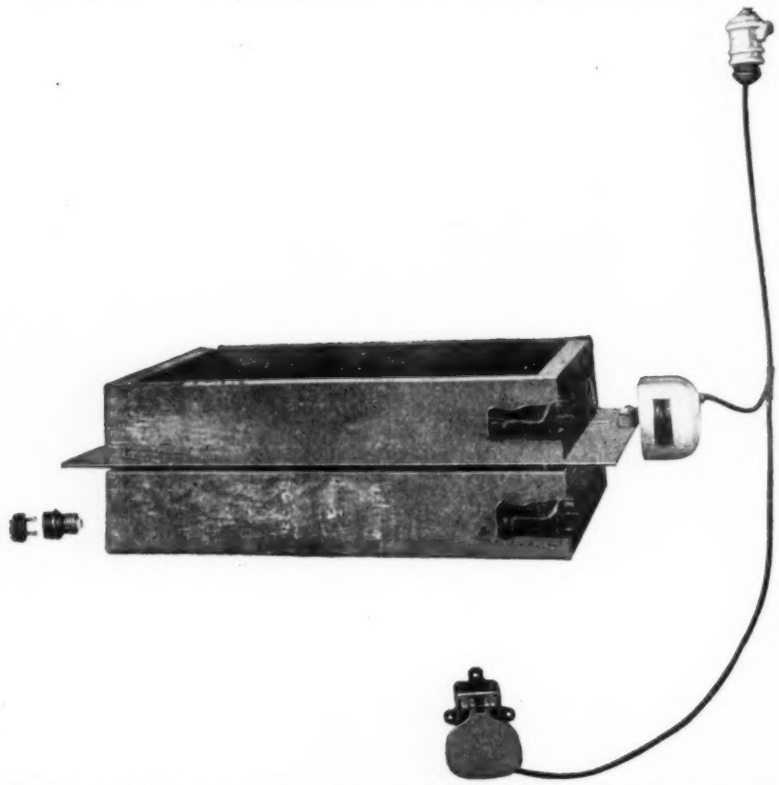
FIG. 3. MAIN FRAME WITH FIELD AND COMMUTATING POLES.

perforated or totally enclosing covers for protection against dust, metal chips, dampness, etc. For belt drive the motors can be furnished with either a universal slide rail base or a belt tightener idler pulley.

L & A ELECTRIC VIBRATOR

The vibrator shown in the accompanying illustrations is manufactured and sold by the E. J. Woodison Company of Detroit, Mich., and they say of it that "The vibrator is light in weight and very strongly made and will operate, on account of its construction, on alternating current only."

It is stated that the apparatus may be used on voltages running from 100 up to 220 alternating current, either 30 or 60 cycle. Another important feature of this vibrator is that the cost of operation is placed at an extremely low figure. If the kilowatt cost of electricity is placed at 5 cents then the vibrator worked a quarter of the time, an eight-days' run, would cost less than 2 cents. As the vibrator does not use any more energy than a sixteen candle power lamp, it may be attached to any lighting circuit which the Fire Underwriters will sanction.



TYPE A.—VIBRATOR ATTACHED TO PATTERN PLATER WITH CONNECTION TO LIGHTING SYSTEM AND KNEE SWITCH.

WATER SEAL

By B. W. Gilchrist, Foreman Plater.

Few things are more exasperating in the plating room than the leaks that occur in the wooden tanks in which large solutions of acid copper and nickel are usually contained. Tanks that have run satisfactorily during the winter months frequently spring leaks in the most unexpected and mysterious manner with the advent of warm weather. Many a good solution has vanished between sunset and daylight, causing a loss of many dollars in salts and valuable time. Small tanks containing one hundred gallons or less seldom give much trouble; but where solutions are above this amount leaks are continually causing a fracture of the Third Commandment when a perfectly good solution has gone to perdition through a crack smaller than the eye of a needle, and usually at the time when needed most.

Joints plowed out—brass rods running from top to bottom, and from side to side, have been found of no avail. Seams set in white lead have proved a delusion and a snare more than once. Asphaltum and pitch, no matter how hot or carefully applied, sometimes fail, and the question of "Lining or No Lining"—like the poor—we have always with us. Lead lined tanks are so expensive as to be prohibitive in many instances, and most substitutes are either detrimental to the solution or are otherwise unsatisfactory. Three-inch lumber seems quite as liable to cause trouble as is two-inch, at least that is the experience of the writer. White pine is so scarce that most tanks are now made of cypress, which, having a greater expansion and contraction, is a poor substitute for the more expensive pine of some years ago. But with proper care and treatment can be made quite as efficient. This treatment is the crux of this article—which I trust may prove as valuable to others as it has to me.

Water Seal is a composition largely used in roofing and is a mixture of about the consistency of putty, that can be applied to even wet surfaces to prevent leaks. To make a leaky tank tight loosen up the rods and open each seam, applying with a small trowel a thin coat of Water Seal. Replace rods firmly, and after standing for a few hours to set, the tank will be found to be perfectly tight, and no change in atmospheric conditions will affect it thereafter. Should there be a slight scum of oil on the surface of the solution, remove same with tissue paper, and no further trouble will be found. The cost of opening the seams may be considered expensive and unnecessary in the case of a small leak. But the time consumed in patching and the loss of solution more than justify the trouble, and when we consider the fact that the result is permanent it is really quite insignificant in comparison. To show the value of Water Seal—take five rough-plated boards, nail them together, and having given them a coating on the inside only of about one-sixteenth inch thick, it will be found, after standing for a few days, the joint will be thoroughly tight and able to resist an acid copper solution. Water Seal does not become hard or brittle. It does not crack. It expands and contracts with the boards. It is not affected by nor is it detrimental to acid copper or nickel solutions. It is cheap, and, last but not least, requires no boiling, being used cold as it comes from the barrel. The above results have been obtained from more than two years' trial with unfailing esults.

NEWMAN MACHINE ATTACHMENTS

The cuts below show attachments made by The Newman Manufacturing Company of Cincinnati, Ohio. The company claims that by their use "any standard lathe may be converted into a more improved turret lathe or screw machine than can be purchased in the open market. These devices as illustrated in Figs. 1 and 2 comprise a tail stock turret and a tool post turret, either or both of which may be easily and readily attached to any size lathe. The tail stock turret accommodates five distinct and

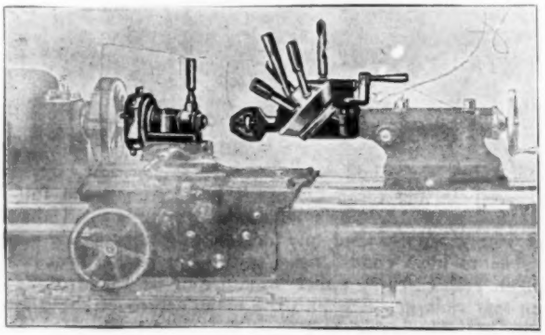


FIG. 1. SHOWING ENGINE LATHE MADE INTO A COMPLETE TURRET LATHE OR SCREW MACHINE WITH THE TWO DEVICES ATTACHED.

separate tools and is attached in a few seconds to the outside of sleeve of tail stock performing operations as well or better than the best turret lathe made. The tool post turret provides an especially important improvement to a lathe in that it has provision for carrying four separate tools instead of one as in the case of an ordinary tool post, an advantage that must be obvious to any mechanic familiar with the disadvantages of the old type of one-tool tool post.

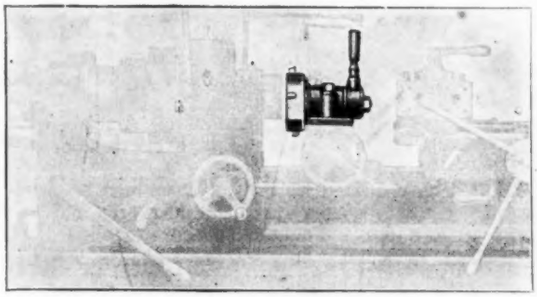


FIG. 2. SHOWING TOOL POST TURRET ATTACHED TO TURRET LATHE OR SCREW MACHINE.

"Another distinctive feature of these attachments is their perfect rigidity and ability to withstand strain equal to the tail stock or carriage of the lathe itself. With these two devices attached to a lathe any kind of work can be done with the tool post turret, such as forming, roughing, boring, finishing and knurling without stopping the lathe or shifting belts. The attachments are made very substantial, are accurate and adapted to the smallest or largest sized lathe made."

HIGH-SPEED COMPOUND BUFFING LATHE

By Paul L. Pryibil.

The construction of this machine is decidedly unique. It stands in a class by itself. The spindle is not driven directly

THE HIGH SPEED COMPOUND BUFFING LATHE.

by a belt, but by an intermediate friction wheel. This construction has two advantages over the ordinary buff.

First, higher speed than can be obtained by direct belt drive, and secondly, elimination of a separate countershaft, thus making the machine a unit.

The advantage of running at a speed of from 50 per cent. to 100 per cent. greater than any other buffing lathe is at once apparent since buffs or brushes of limited diameter have often to be employed for polishing the interior of small articles, as, for instance, hollow ware in the sterling silver and plated ware line, and thousands of other cases too numerous to mention.

The machine consists of an iron housing, cast out of one piece, enclosing a friction wheel mounted on high grade ball bearings. The shaft of this friction wheel extends through this housing on one side with a pulley to be driven by a belt from a motor or a line shaft.

Hinged to this main housing is a smaller housing, which carries the buffing spindle mounted on high grade ball bearings also, and equipped with a small friction wheel. A single turn of a small hand wheel produces contact between the two friction wheels, thus starting the spindle. The same motion in the reverse direction stops it.

The large friction wheel is three times as large as the small one which carries the spindle, and therefore drives the spindle at triple speed; 2,500 revolutions of the large wheel means 7,500 revolutions of the spindle. The joint between the main housing and the spindle housing is dust proof. The ball bearing casing is also protected in a similar manner. Dirt cannot enter the ball bearing or between the friction wheels. The machine is manufactured by the P. Pryibil Machine Company, 512-524 West 41st street, New York City.

TIRRILL GAS FIRE POT

This gasfire pot is large enough to accommodate two soldering coppers weighing 6 pounds each, while the smallest ones are heated equally as well. It is suitable for all kinds and grades of gas. Can be used with or without valves. This is operated as an atmospheric burner, or under air pressure from a blower or other air supplies.

The design is neat and not clumsy looking, weighing all told 23 pounds. The interior is cast iron, there being no bricks inside to cause dirt. In fact, the whole fire pot is constructed of cast iron, with a heavy sheet iron outer jacket.

It is considered that to obtain the best results the flame must be directed against the soldering coppers. Therefore, burner is put on the side which does not allow waste of any heat, besides keeping the burner clean.

The burner used is a rose burner, drilled with a quantity of fine holes which insures perfect combustion. Any desired heat from the most intense to the most gentle flame is absolutely at the operators control.

The fire pot is manufactured by the Tirrill Gas Machine Lighting Company, 103 Park avenue, New York, N. Y.

CARLSRUHE CLEANSER'S NEW HOME

The formal opening of the new quarters (illustrated in our May, 1916, issue) of James H. Rhodes & Company, manufacturers of Carlsruhe metal cleanser, 157-159 West Austin avenue, Chicago, occurred on June 6. Elmer R. Murphey, president, and his staff welcomed the host of visitors who called and with just pride escorted the guests from "cellar to garret" and explained in detail all features of the method and system used in conducting the business. A torrent of rain kept many away, but it did not dampen the ardor of those who were in attendance. The private office of President Murphey is done in old English style, and the furniture is actually of the Italian period, showing exceptional taste in its selection. The board of directors' room and other private offices are appropriately designed and furnished. The heating and ventilating system is of the most improved order; in fact, everything in the building is arranged on scientific principles, which will contribute to the greatest efficiency. On one of the floors a dozen barrels of Carlsruhe cleanser were noticed. Although Rhodes & Company keep their stock in their warehouse at Twenty-eighth and Albany streets, they carry a small stock of Carlsruhe cleanser downtown for express shipments, and for the convenience of some of their city trade.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS.

AMERICAN SOCIETY OF TESTING MATERIAL

A. A. Stevenson, of Philadelphia, was elected president of the American Society for Testing Materials at the annual convention held at Atlantic City, N. J., June 28 and 30. Other officers chosen were: Vice-president, S. S. Voorhees, Washington, D. C.; executive committee, W. H. Bassett, Waterbury, Conn.; John Brunner, Chicago; G. W. Thompson, Brooklyn, and F. B. Turneaure, Madison, Wis.

NEW PROPOSED METAL STANDARDS

Non-ferrous metals and alloys were discussed at length at the annual meeting of the American Society for Testing Materials, held at Atlantic City, June 27 to 30. Extensive revisions in the standard specifications for spelter were recommended, which consisted essentially of a change in the grading of virgin spelter by addition of the grade *Selected*, these grades now being as follows: *A*, High grade; *B*, Intermediate; *C*, Brass Special; *D*, Selected, and *E*, Prime Western.

In the former specifications it was provided that Brass Special spelter shall not contain over 0.75 per cent. lead, 0.04 per cent. iron and 0.75 per cent. cadmium. It also was to be free from aluminum and the sum of the lead, iron and cadmium was not to exceed 1.20 per cent. This was changed as follows: Brass Special spelter shall not contain over 0.60 per cent. lead, 0.03 per cent. iron and 0.50 per cent. cadmium, and the sum of the lead, iron and cadmium shall not exceed 1 per cent. Selected spelter shall not contain over 0.80 per cent. lead, 0.04 per cent. iron and 0.75 per cent cadmium. It also was to be free from aluminum and the sum of the lead, iron and cadmium shall not exceed 1.25 per cent. The previous specifications for Prime Western spelter provided that it shall not contain over 1.50 per cent. lead and 0.08 per cent. iron, whereas the revision decreases the percentage of iron to 0.06, the percentage of lead remaining unchanged.

The section referring to sampling was stricken out and the following substituted: "Select 10 slabs at random from a car load and saw each slab completely across from the middle of one long side to the middle of the other, and use the sawdust as the sample; or, drill three 9 mm. holes along one diagonal of each slab, boring completely through, and taking care to make fine drillings; the holes should be drilled as nearly as possible at the middle and half way between either end and the middle of such diagonals. Go over the drillings or sawings with a powerful magnet to take out any iron which may have come from the drill or saw, and mix the sample thoroughly. The drill or saw must be thoroughly cleaned before use, and no lubricant shall be used in either drilling or sawing."

Section 7 of the former specification on analysis was substituted by one which provides for both electrolytic and lead acid methods of analyses.

W. M. Corse, chairman of the sub-committee on sand cast metals and alloys, reported that data had been collected on various types of alloys, and a study is being made of the relation between elastic limit and yield point as well as the behavior under compression.

G. H. Clamer, chairman of the sub-committee on non-ferrous alloys for railroad equipment, presented proposed tentative specifications for copper plates, locomotive fireboxes, bars, staybolts and seamless boiler tubes, and the various non-ferrous alloys for locomotive equipment in ingots, castings and finished car and tender bearings.

The proposed mixtures are as follows:

NON-FERROUS METAL MIXTURES.

Alloy.	Copper, Per Cent.	Tin, Per Cent.	Lead, Per Cent.	Zinc, Per Cent.	Iron, Max., Per Cent.	Antimony, Per Cent.	Phosphorus, Max., Per Cent.	Aluminum, Per Cent.	Sulphur, Max., Per Cent.	Total Impurity, Including Zinc, Per Cent.
Bearing metal No. 1	remainder	9-11	9-11	1.5*	0.4	0.5*	....	none	....	1.0
Bearing metal No. 2	remainder	7-9	14-16	1.5*	0.4	0.5*	....	none	....	1.0
Bearing metal No. 3	remainder	7-9	14-16	3.0*	0.4	0.5*	....	none	....	1.0
Bearing metal No. 4	remainder	4-6	15-20	5.0*	0.4	0.5*	....	none	....	1.0
Bell metal	remainder	16-8	0.25*	0.25*	0.25	0.25*	0.02	none	0.05	0.5
Steam metal	remainder	5-7	2-3.5	3-5*	0.25	0.25*	0.02	none	0.05	0.5
Red brass	remainder	4-6	4-6	4-6	0.40	0.40*	0.02	none	0.05	1.0
Yellow brass	remainder	1.5*	1-3	29-33	0.50	0.50*	....	none	....	1.25
Brazing metal	remainder	0.5*	0.5*	18-22	0.40	0.25*	....	none	....	1.0
Babbitt metal	0.5*	9-11	remainder	0.10*	0.5	15-17	....	none	....	0.75
Lining metal	0.5*	4-6	remainder	0.10*	0.5	9-11	....	none	....	0.75

*Maximum.

AMERICAN FOUNDRYMEN'S ASSOCIATION

That the exhibition of foundry equipment and accessories, machine tools, etc., to be held at Cleveland, during the week of Sept. 11, concurrent with the annual meetings of the American Foundrymen's Association and the American Institute of Metals, will surpass in magnitude any similar undertaking, is indicated by the large number of manufacturers who already have made reservations for space. Fully 90 per cent. of the exhibition area of the Coliseum has been disposed of and since 10,000 additional square feet will be required to meet the needs of the prospective exhibitors, it has been decided to erect a temporary building on a lot directly across the street from the exhibition hall. At a meeting of the exhibition committee of the American Foundrymen's Association, held at the Hotel Statler, Cleveland, on Saturday, June 24, the erection of this annex was authorized.

The two buildings will be connected by a runway, making it unnecessary for the visitors to descend to the street when passing from one to the other. In the temporary structure it is planned to place all of the large operating machines requiring heavy foundations and it is probable that several different types of melting furnaces will be shown in operation. The annex will be converted into a temporary foundry where molds will be made and poured. Since the Coliseum was erected, many shows

have been held in this structure which affords 60,000 square feet of floor space, but this industrial exhibition will be the first to overflow its generous dimensions, making necessary the erection of a temporary annex to provide space for all of the manufacturers who contemplate making exhibits. This industrial exhibit will be the biggest and most complete show of its kind ever held in Cleveland and the local interest now manifested points to an unusually large representation of Cleveland products.

Although more than two months still intervene before the opening of the exhibition, 95 manufacturers already have made reservations and the indications are that this total will be swelled to 150 when the doors of the Coliseum and the annex are thrown open on Monday, Sept. 11. At Atlantic City last year there were 102 exhibitors and never before in the history of this exhibition movement has as much space been reserved so far in advance of the opening of the show as this year.

The papers and committee reports to be presented at the annual meeting of the American Foundrymen's Association promise an unusually valuable and interesting program. Separate sessions will be held for the discussion of topics relating to the manufacture of gray and malleable iron, and steel castings. The opening meeting will be held at the Hotel Statler, Monday afternoon, Sept. 11, which will be followed by morning sessions only, the convention closing, Friday, Sept. 15. This arrangement will afford the foundrymen more opportunity to inspect the exhibits than has been the case in former years with two sessions daily, although the length of the program will necessitate several simultaneous meetings.

Three symposiums will feature the program, the subject of which follow: "The Results of Closer Co-operation between the Engineer and the Foundry as relating to Gray and Malleable Iron, Steel and Non-Ferrous Metals"; "The Influence of Gating on Castings, including Gray and Malleable Iron, Steel and Non-Ferrous Metals" and "Electric Furnace Practice as relating to the production of Steel Castings." Four authors will present papers for each of these symposiums and every phase of these respective subjects will be discussed. Several interesting papers on sand reclamation also will be presented, covering investigations made among all of the members of the American Foundrymen's Association and by the United States Bureau of Standards.

EXPOSITION OF CHEMICAL INDUSTRIES

That the Chemical Industries are alive to the situation they now occupy in the sum of affairs is evident by the great numbers of firms that have engaged space at the Second National Exposition of Chemical Industries to be held at the Grand Central Palace, New York City, during the week of September 25-30, 1916.

The Advisory Committee of the Exposition has been increased and is composed as follows: Chas. H. Herty, Chairman; Raymond F. Bacon, L. H. Backeland, Henry B. Faber, Francis A. J. Fitzgerald, Bernhard C. Hesse, A. D. Little, R. P. Perry, Wm. Cooper Proctor, E. F. Roeber, George D. Rosengarten, T. B. Wagner, Utley Wedge, M. C. Whitaker, and Charles F. Roth and Adrian Nagelvoort, Managers.

The roster of exhibitors is an honorable roll of the most important and progressive companies doing business with those industries wherein chemistry plays a part. From this list we can see that the Exposition is already twice the size of its very successful predecessor.

The American Chemical Society will hold its Annual Meetings during the whole week—the program for the meeting is now being arranged and the committees appointed. A reception and a hotel committee will arrange that the members of the society will be comfortably located during their stay in New York. The capacity of the hotels about the Grand Central Palace will be greatly taxed to accommodate the host of visitors who will be in the city.

The American Electrochemical Society have arranged to hold their meetings the latter part of the week, September 28, 29 and 30 being the dates chosen, and at least one of these days will be devoted to papers that will add greatly to and form a memorable session. Committees are already appointed and the program is in active preparation.

The American Electrochemical Society, which will hold its meeting in New York during the same week as the Exposition, has announced its program as follows: Wednesday, September 27, evening: general reception with registration at the Chemical Exposition, Grand Central Palace; Thursday, September 28, forenoon: reading and discussion of papers, general subject: "Made in America"; luncheon; afternoon: visiting the exposition; evening: complimentary smoker. An invitation will be extended to the members of the American Chemical Society and other visiting chemists and engineers; Friday, September 29, forenoon: reading and discussion of papers; luncheon; afternoon: visiting the exposition; evening: subscription dinner-dance; Saturday, September 30, forenoon: reading and discussion of papers; luncheon; afternoon: visiting the exposition.

AMERICAN ELECTRO-PLATERS' SOCIETY

New York Branch—H. H. Reama, president, and William Fischer, 245 East 23rd street, New York, secretary.

After the regular business at the meeting held on Friday evening, June 30, the new officers elected at the previous meeting were installed.

Toronto Branch—W. J. Salmon, president, and E. Coles, secretary and treasurer.

At the last regular meeting of this branch the following officers were elected for 1916-1917: W. J. Salmon, president; J. Acheson, vice-president; E. Coles, secretary and treasurer; J. Magill, librarian; J. Young, sergeant-at-arms, and C. Orr, J. Villaier and W. W. Wells, Jr., trustees.

Providence Branch—Alfred Senecal, president, and Albert J. Lemrise, secretary.

The meetings of this newly formed branch are in full swing and are held twice a month, the second and fourth Wednesday, at 60 Weybosset street, Providence, R. I. The officers are Alfred Senecal, president; Hugh McGinness, vice-president; Albert J. Lemrise, secretary; Albert M. Pepin, treasurer; Arthur W. Wood, librarian; John M. Douglas, sergeant-at-arms, and L. G. Galamean, Louis Poinir and Andrew McQueeney, board of managers.

Newark Branch—Edward W. T. Faint, president, and Philip Sievering, secretary.

On Friday evening, June 16, the officers recently elected for the ensuing year were installed, after which George Neimeyer gave a very interesting talk on silver; H. H. Reama, president of the New York Branch, gave a brief address; Mr. Mitchell, chemist of Tiffany and Company, gave a short address on elementary chemistry and the standardization of chemicals, and he was followed by Rev. A. W. H. Thompson, Forest Hill, N. J., the principal speaker of the evening. Dr. Thompson devoted his remarks to preparedness, and dwelt on the different kinds of preparedness. He also spoke of the many ways in the present day whereby the platers can help themselves, and by so doing help others.

The following officers were installed by Mr. Haddow for the year 1916-1917: Edward W. T. Faint, president; Louis H. O'Donnell, vice-president; Philip Sievering, secretary and treasurer; George Reuter, Jr., recording and corresponding secretary; O. J. Sizelove, librarian; Theodore Kreuder, sergeant-at-arms; and Joseph Binder, assistant sergeant-at-arms and Messrs. Smith, Merrigold and Berfels, trustees.

St. Louis Branch—H. H. Williams, president, and F. C. Rushton, 4405 Blaire avenue, St. Louis, Mo., secretary.

The regular monthly meeting of this branch was held on June 17, in the assembly room of the St. Louis Public Library at which time the subject of the 1917 convention of the association was brought up for consideration and the delegates to the Cleveland convention were instructed to use every effort to obtain the convention for St. Louis in 1917. Mr. Duebelbeis gave a very interesting half hour talk on the successfulness of simultaneous copper plating and cleaning.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST.

George J. Wiegand is now connected with the Tulford Manufacturing Company of Providence, R. I.

Charles J. Caley, formerly manager of several large hardware plants in the United States and Canada, has gone on a trip to England.

Frank Krug, formerly representing the Joseph Dixon Crucible Company, Jersey City, N. J., with headquarters in Philadelphia, has been appointed sales manager of White and Bros., Inc., ingot metal manufacturers, Philadelphia, Pa.

C. L. Tiddes, formerly proprietor of the Reliable Electro Plating Company, Paterson, N. J., is now connected with the General Platers' Supply Company, Inc., successors to Zucker & Levett & Loeb Company, 29 Broadway, New York.

The will of the late Frederick Dietz, president of the R. E. Dietz Company, manufacturer of lamps and lanterns, New York, who died March 31, 1915, throws an interesting sidelight on the character of this metal man. Under his will the following bequests to employees were made: $5,000 to Pomeroy L. Salmon, manager of the Syracuse factory; $5,000 each to Charles L. Betts and Ernest E. Everett, employed in New York factory; $500 each to twenty-four, $400 to eighteen, $300 to twenty-five, $100 to eighty-six and $25 each to 225 employees, the bequests being made according to term of service.

DEATH

J. B. Wise, president of J. B. Wise, Inc., metal manufacturers of Watertown, N. Y., died suddenly at Atlantic City, N. J., June 7. Thomas B. Wise was born in Branford, Conn., December 27, 1858, and moved with his parents to Watertown, N. Y., in 1869. In 1877 Mr. Wise became a partner with his father in the manufacture of hardware specialities in a small shop on Huntington street. He continued here in this business until 1891, when he moved to the factory building on Mills street, north of the Black River, where the plant is located at the present time.

During his business career Mr. Wise was connected with a number of industries to which he gave considerable attention. He was president of the old Singer Fire Alarm Company, the Watertown Brass and Manufacturing Company, was secretary and treasurer of the Ryther Manufacturing Company, and during the life of the Union Cartridge and Gear Company was vice-president and a director. All of these concerns were located in Watertown.

J. B. WISE.

Mr. Wise was a great believer in practical training for boys, and for this reason he interested himself in a project of establishing a trade school in Watertown. Although he was never successful in bringing this to a head, he formulated a definite movement, and it is said that some day such a school will be established in the city of his adoption.

Mr. Wise was very active politically and served his home city as mayor on the Republican ticket for four terms.

Mr. Wise was well known in fraternal circles and was a member of Watertown Lodge, No. 49, F. & A. M., Watertown Chapter, No. 59, R. A. M., Watertown Commandery, No. 11, K. T., and Media Temple, A. A. O. N. M., S. He was also a member of Corona Lodge, No. 705, I. O. O. F., and of the Circumnavigators' Club of New York.

Surviving are his widow, Mrs. Hattie Willard Wise; two sons, Charles Ralph Wise and Earl Willard Wise; a brother and four sisters.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS.

WATERBURY, CONN.

JULY 10, 1916.

Steps were taken this week by Waterbury manufacturers to solve the worst problem in industrial conditions here for months, the housing problem. Announcement has just been made of plans for the erection of scores of new homes for workingmen on the famous Washington model home plan, and the Scovill Manufacturing Company and the American Brass Company are taking the lead in this undertaking. The Chase Metal Works and allied corporations have begun the erection of homes on land they own, and before a year hence there will be hundreds of new dwellings which the shop workers can own by paying instalments about equal to their rent under normal conditions. This will insure rapid reduction of the serious congestion that now affects every portion of the city, and which is a heavy handicap on the employers seeking help, as well as on the efficiency of the workers who are necessarily separated from their families and living under abnormal conditions that are not pleasant, though they are expensive.

Beyond this new phase of local activity there is little out of the routine to report. High wages and extra dividends have come to be routine here. The Scovill Manufacturing Company has been paying a bonus monthly since last October to its help, in the form of a dividend, figured on their earnings. The stockholders also have received an extra dividend of ten per cent. every month, and the quarterly regular dividend of two per cent. also has been paid. The company is employing about 12,000 hands, and while this is more than twice as many as were employed two years ago, the efficiency of the plant has been improved, and the problems of organization seem to have been very capably handled. The company finds out what it can do with each class of help, and when one piece of work proves incompatible, an employee is tried out on another so that he

doesn't find it so hard to make good. Wages run high in all the Waterbury plants, and their operation is practically on a fifty-four-hour week basis, extra pay being given for all overtime work.

The Scovill company is publishing a monthly shop paper now, which gives up much space to intimate talks with employees on such matters as "safety first" policies, efficiency courses, continuation schools, etc., and "gets away with it." As an example of the spirit of the organization some 300 employees have accepted the company's offer to pay part of the expenses of a lecture course on efficiency systems if a class could be organized.

All branches of the big plant, which has multiplied its size several times since August, 1914, are working at full capacity, and if there has been any falling off here of orders for munitions or kindred goods, it is not noticeable. It is known, too, that there have been better orders from domestic consumers of various lines of goods in the past six months, and busy times are ahead in all Waterbury and Naugatuck valley plants for months to come. The American Brass Company is running "full blast" with its greatly augmented plants in Torrington, Waterbury, Seymour and Ansonia. The Chase Metal Works is extending its big tube mills in Waterville, and planning to do much more than tube-making there. There is a big casting shop there now, and materials for novelties and similar goods are to be turned out there, in addition to the product of the old plant of the Waterbury Manufacturing Company.

Clock and watch business is good, though not so booming as some other lines. Clocks are selling well, and watches keep up their normal speed. The new Ingersoll-Waterbury has been put on the market, and is making a hit, but the old Ingersoll models at a dollar and thereabouts still hold the market. The new model, with four jewels, is selling at $2.50. Its home, that of the historic Waterbury watch, is again a busy hive of industry.

Collections have been good and orders generally reported to be coming in satisfactory volume, including practically everything from safety pins to engines for aeroplanes. There never were better times here, although prices are high. Freight is not moving as rapidly as desired, but conditions are greatly improved over those of two months ago.

Waterbury sent 360 miltiamen out in three companies on the mobilization order, and then recruited almost as many more who will depart July 11 for the border. The factories are continuing married men on their payrolls or looking after the needs of their families, and some are doing the same for the single men also.—F. B. F.

NEW BRITAIN, CONN.

JULY 10, 1916.

The Barnes & Kobert Company, of Milldale, Conn., which gives employment to 225 operatives, will lease a part of the New Britain Chamber of Commerce factory, originally built for the Hartford Auto Parts Company, and will engage in manufacturing here. Galvanized hardware and electrical accessories are manufactured by this concern, which has a capital stock of $500,000, half of which is common and half preferred. The company was organized two years ago and by the quality of its products quickly built up a thriving trade until it has outgrown its present plant. It is expected that the new concern will occupy the local factory by July 15 and may possibly open negotiations for the purchase of the entire building in due time. James M. Carney, of the Hartford Auto Parts Company, is a member of the directorate and will direct the business here. Whether the Auto Parts Company will ever occupy the structure is in doubt. The company is very much unsettled and has been approached with several propositions to merge with other concerns.

Already there have been two indications of brewing labor troubles here this spring, there having been two small strikes, the one this month having been at the foundry of the Russell & Erwin division of the American Hardware Corporation. About fifty hands struck for more pay, but the strike was poorly organized and died a natural death, the men returning to work one by one, after they had remained away for several days. There is a report in manufacturing circles that the Russell & Erwin Manufacturing Company is engaged on an enormous government contract for the manufacture of a certain kind of caps to be used in munitions. General Manager B. A. Hawley, however, denies the story positively.

The American Hardware Corporation is rapidly forging to the fore again in the manufacturing business and is rushed with business. In view of the many large contracts recently secured and the large ones promised, the company's stock has increased from twelve to fourteen points and the dividend has also been increased and an extra dividend declared. The New Britain Machine Company is also thriving and extra dividends have been declared. The North & Judd Manufacturing Company, which has already had enormous war orders from Europe and the United States, is preparing to take now contracts from the government for equipping the cavalry. The directors have increased the capital stock a half million dollars, and $250,000 of this increase has been issued. The remaining $250,000 is held in the treasury and will be issued when and as the directors see fit. Plans are even now being drawn up for the building of another large factory building to take care of the increased business.

All of the local manufacturers have been hit hard by the calling out of the state militia to do border duty, as the soldiers are almost all employed in the factories. However, the managers have shown their patriotism by agreeing to hold their positions open for them, and most of the concerns are making financial concessions to their soldier-employees. Even should a war arise between this country and Mexico, it is said that it would not affect the local manufacturers' business to a very great extent, as their export trade in that southern republic is not large.—H. R. J.

PROVIDENCE, R. I.

JULY 10, 1916.

The metal trades in practically all of its branches and allied lines continues to hold the centre of the industrial stage for interest, activity and importance, most of the plants in this city and throughout the state having more than enough work on hand or orders on their books to keep them running to capacity or better, until after the close of the present year at least. Skilled help is the great problem which confronts nearly every concern. But there is also an alarming shortage of unskilled labor that is proving a very trying proposition for the plant managers or superintendents.

The past month has shown a slight improvement in the jewelry industry over the preceding one and a very considerable increase over the corresponding month of 1915. Many orders are reported as coming from the trade throughout the country, while reorders are sufficient to keep most of the manufacturers comfortably busy and happy. It is generally acknowledged that much more work could be done by the majority of the plants than is being turned out at present, but the factories are working far better than a year ago, and few of the manufacturers will complain if they can maintain the present schedule through the summer.

Brown & Sharpe Manufacturing Company has given notice that it will continue all of its employees who are members of the National Guard organizations for one month on the payrolls. If the troops are disbanded within that time the men will find their jobs awaiting them on their return.

The H. H. Holmes Company of this city, with a capital stock of $10,000, for the purpose of dealing generally in mill and office equipment, machinery, tools, etc., was granted a charter the past month by Secretary of State Parker. The incorporators are Harry H. Holmes, Irving J. Law and Arthur N. Noyes, all of this city.

The Atlas Machinery Company, capitalized at $30,000 to be located in this city, which will deal generally in mill supplies, engines, machinery, appliances, automobiles and motorcycles, has been incorporated at the office of the Secretary of State under the laws of Rhode Island. The incorporators are Volney P. Kinne and Charles A. Cunningham of Buffalo, N. Y., and B. W. White of Cranston, R. I.

The Central Sheet Metal Works, 164½ Willard avenue is being conducted by Benjamin Rakatansky, according to his statement filed at the office of the city clerk.

Benjamin Kessler and David Jaffe are the owners of the

Narragansett Sheet Metal Works, 216 Chalkstone avenue, this city, according to their statement filed at the City Hall.

Ground has been broken for a one-story addition to the plant of Pawtucket Screw Company, on Hughes avenue, Pawtucket. The new addition will be of brick, 40 x 11 and will cost $6,000. It will be equipped with new and up-to-date automatic machinery. The company started in business about five years ago and the demands of the trade have necessitated the running of the plant day and night for the past year. The present force will be doubled when the new addition is finished.—W. H. M.

BUFFALO, N. Y.

JULY 10, 1916.

The metal trade in this market is as busy as it was a month ago. And judging from present indications it appears that business in this market will be very good throughout the summer. A number of the local concerns have already booked enough orders to keep them busy for most of the forthcoming summer months.

The drop in metal prices has been halted with enthusiasm by the local dealers. And as one of them put it: "It is the first time in months that we have been able to make a little money. In the past, the prices in metals rose so rapidly that it was almost impossible to keep pace with them. In fact we were not able to advance our prices so rapidly. Our customers, who had been doing business with us for years, absolutely refused to stand for such rapidity in price as we were trying to enforce. As a result, we were not able to make all the profits to which we were justly entitled to receive. Again, this drop in metal prices means also that we are now able to break even on some of our blanket contract orders. This contract order business has truly been a hardship and exceedingly trying at times."

On June 24 nearly three thousand foundrymen marched up Main street in the Buffalo Preparedness Parade to the beat of drums and strains of brass horns. William H. Barr was the Grand Marshal of the foundrymen's division, which was one of the few very large divisions. The various superintendents and owners of foundries acted as captains, usually at the head of their own employees.

All of the foundries in this locality are quite active. Casting prices are said to be very much more satisfactory. Inquiries are coming in steadily and business on the whole is reported to be very much better than it was year ago.

The National Bronze Foundry Company is making a number of improvements in its establishment, particularly in the line which spells great comfort and conveniences for its employees. This foundry during the last month made some very large castings. Two of them weighed 1,260 pounds each and six of them weighed 600 pounds each. They are also busy with a number of automobile castings.

Another large contract has been awarded the Unique Brass Foundry Company by the Pierce Arrow Company. Judging from their present volume of business it will not be very long before they will have soon outgrown their new quarters which they just occupied.

The platers are unusually busy. Ever since the first of March these tradesmen have had an exceptionally continuous stream of good business. In fact, it has been reported that many years have elapsed since they have been so busy. Some even say that they have never been so busy in their entire history.

The Fries Plating Company report that they have enough orders on hand to keep them busy for some months to come. The A. F. Flanders Manufacturing Company also reports that their business is very much better than last month.

The Washington Plating Company is expanding each month. During the last month they were compelled to add four new tanks to their equipment in order that they might take care of their ever increasing volume of business. This firm has actually tripled the size of its establishment within the last year.

The finishing and rolling mills show signs of dropping off in their business. The last two years have been remarkable ones for these metal men.

The Buffalo Copper and Brass Rolling Mill have contracted for 6,000,000 pounds of copper and millions of pounds of other metals.

The Zero Valve and Brass Foundry have been doing considerable brass work for residential purposes during the last month. —G. W. G.

NIAGARA FALLS, N. Y.

JULY 10, 1916.

Trade in the Cataract City in the non-ferrous lines is not as brisk as it was a month ago. The adverse weather conditions, scarcity of labor, etc., are among the reasons for this temporary lull. The prospects of the future are encouraging as most of the local dealers are of the opinion that this summer's trade will be very much better than it was last year.

All of this will be determined, to some degree, if we will engage ourselves in a state of warfare with Mexico. Such is the opinion of a number of local men. A Mexican War, they maintain, would cause business to become very much unsettled. Labor would be more difficult to obtain than it is at present. The prices of copper and other metals would soar sky high, so much so that men would think twice before they would order castings, etc.

The drop in metal prices is looked upon by all local dealers with satisfaction. Most of the foundries are not as active as they were a month ago, yet business cannot be said to be discouraging. A larger number of inquiries began to make their appearance in this market toward the end of the month.

The specialty and souvenir manufacturers and stamping mills are quite active, particularly those making fancy metal souvenir picture frames, etc. The summer tourists have begun to arrive and the manufacturers and retailers are preparing for a busy season.

The Norton Company, who have a large abrasive factory at Chippewa, Ontario, Canada, are building 23 new houses for the benefit and comfort of their employees. Each house is to be equipped with all modern improvements and cost $2,500. In addition to this, the Norton Company contemplate making additions to their present plant at this point. A concrete dock is to be constructed at the foot of Second street. At this point the company intends to receive a large part of their raw material which is to arrive by boats and they already have chartered several large steam barges.

The Spirella Company reports that their production this year is far in advance of that of last year.

The new addition to the Niagara Search Light Company is nearing completion.

A. Wright reports that both his plating and jewelry departments are doing very much more than they were a year ago.—G. W. G.

ROCHESTER, N. Y.

JULY 10, 1916.

The Flower City metal trade continues to be fairly brisk. In some lines, however, a slight dropping off is noticeable. Most of the concerns are optimistic concerning future trade. In fact some of them are making alterations and repairs, and additions in order that they might better care for their trade.

During the last month a number of the local dealers attended the two-day trade tour of the Rochester Chamber of Commerce, jobbers, etc. They visited Manchester, Shortville, Clifton Springs, Phelps, Geneva, Penn Yan, Dunder and Canandaigua, N. Y. The entire trip was looked upon as one which would promise much fruit. It was solely an advertising tour for advertising Rochester's wares, etc.

The Ritter Dental Manufacturing Company and the Rochester Stamping Company's employees and some of the other concerns were among those local concerns which had separate units in the Rochester Preparedness Parade which was held within the last month.

A slight falling off is noticeable amongst the foundries. The platers and the finishers, on the other hand, are very active.—G. W. G.

COLUMBUS, OHIO

JULY 10, 1916.

The metal market in Columbus and central Ohio territory contines fairly active; although sharp declines have caused some unsteadiness. Outside of Babbitt and some other metals, most of the items are off from the prices which prevailed a month ago.

But buying is holding up pretty well, especially for immediate requirements. Users are loath to accumulate stocks on a falling market and are only buying what is absolutely necessary. The consumption of metals in this territory is holding up well as several new metal using concerns have been formed recently.

The supply is now equal to the demand and in some cases larger. Shipments have been delayed to a certain extent by the car shortage which is becoming worse as the summer advances. Activity in machine shops continues at a high level and foundries have all that they can do. One of the best features is the fact that ordinary domestic demands as distinguished from the demand growing out of the war is steadily increasing.

Copper is slightly off in the local market. Prices are around 25¼ to 26 for crucible shape. Brass is also off from the prices a month ago and it is difficult to secure a firm quotation. Aluminum is holding up fairly steady and is selling at 52 cents. Zinc is way off and is selling at 11 cents to the trade. Tin is slightly off, being quoted at 41 cents. Babbitt and type metals are still firm.

The Solar Metal Products Company of Columbus, makers of many metal devices and especially metal doors has just completed a large addition to its plant, located on Cleveland avenue. Orders are coming in fact and future prospects are considered bright.

The authorized capital of the Aluminum Castings Company of Cleveland, Ohio, has been reduced from $800,000 to $400,000.

The Fertel-Dangler-Wilson Company of Cleveland, Ohio, has been incorporated with a capital of $75,000 to deal in all kinds of metals, by R. Hall, W. C. Saeger, R. J. Bulkley, R. H. Jamison and M. T. Flanigan.—J. W. L.

CLEVELAND, OHIO

JULY 10, 1916.

Rapid developments in connection with the Mexican crisis are significant to the metal industry of Cleveland, more so even than at the outbreak of the war in Europe. Probably the most impressive of these is the announcement of the big plants in the Cleveland district that they may pass up the allied nations abroad in order to take care of the needs of the United States in the event of war with Mexico.

It may be remembered that last fall Cleveland metal industries alone had $100,000,000 war orders on hand from the allies, and this huge amount has been added to since that time.

With the war with Mexico almost certain, Cleveland machine shops, which have been manufacturing war munitions, are preparing to meet the emergency if the American government should call on their output. A large number of plants have been operating day and night to fill war munitions orders. While no actual order has come from Washington, the plants here have been asked for a detailed statement as to their output and the length of time it is likely to take to handle orders.

Manufacturers here say the English, Russian and French governments will suffer a severe blow if the United States comes to Cleveland for supplies, as all contracts with the allies will be abrogated. The allies will get only that portion of the output this government does not need.

The American Ball Bearing Company and the Premier Brass Foundry Company are making shrapnel forgings.

Another big development in connection with the Mexican crisis has been the placing of a $1,500,000 order for motor trucks with the Peerless Motor Car Company. These trucks are similar to those which have been shipped to the allies right along, and of course will require much metal material of all kinds. While the original order is for 1,500 trucks, it is announced by the Peerless management it can figure on an additional 2,800 cars. More recently the officials of the company have admitted they are working on war orders, and already are prepared to ship trucks to the border as fast as the government requires them. As European orders have tapered off during the last few weeks, virtually the entire operating force of the Peerless plant can be concentrated on American demands.

Blame for the lack of equipment for the National Guardsmen is laid by local metal products manufacturers to the United States Consulting Board, which, it is claimed, had not been organized soon enough to cope with the emergency. According to F. A. Scott, of the Warner and Swasey Company, manufacturers of machine tools, and who is a member of the board, individual members are now finding out what the soldiers need, as far as Cleveland plants can supply that need. This survey, Mr. Scott says, is for the purpose of preventing shortages. In his opinion, everything in the metal line, aside from munitions, can be supplied by Cleveland firms.

Claiming he has brass poisoning William Rumpf, laborer, has begun a suit against the Rickenberg Brass Company. E. Rickenberg, of the company, says there is no such disease. Rumpf wants $15,000 for, he says, being infected in the company's plant. —C. C. C.

CINCINNATI, OHIO

JULY 10, 1916.

Although activity in the metal trades in this vicinity is not quite as great as at its height a few months ago, operations are still conducted on a scale far in advance of what might be called a normal rate. The machine-tool shops are working at capacity, on orders coming from all quarters of the country as well as from foreign countries, and this condition continues to be reflected faithfully in the foundries supplying metal parts and trimmings of brass and other metals. Indications are that activity will continue for some time to come, because most of the business now on hand is not contingent on any happening such as the end of the war; and domestic orders are steadily improving. Lower prices for metals have had a stimulating effect on business, rather than otherwise, as high figures were beginning to operate as a brake on demand, as they usually do.

The Lunkenheimer Company, one of the leading concerns in the metal trade, manufacturing valves and other engineering specialties, is planning the construction of new buildings and equipment to cost in the neighborhood of $75,000, at its plant in Fairmount, a Cincinnati suburb.

The merger of the Eagle White Lead Company and the Picher Lead Company, of Joplin, Mo., recently accomplished at a special stockholders' meeting of the former company called for the purpose, resulted in the organization of a new company known as the Eagle Picher Lead Company, one of the largest concerns in the lead trade in the world. The Picher company, in which the Eagle company has been interested for some time, has extensive lead mining and smelting interests at Joplin, Mo., and elsewhere, and the consolidated company has now a big business in spelter, pig lead, plumbers' lead goods, lead pipe, white and red lead for the paint trade, and other lead products. The capital stock of the new company is $10,000,000, of which $5,000,000 represents Picher stock, $2,000,000 Eagle stock and the remainder new stock. Employees of the company will be given an opportunity to secure stock in the company on easy terms, $500,000 having been set aside for that purpose.

In the United States Circuit Court of Appeals at Cincinnati the conviction of Sam Kasle, of Toledo, O., on a charge of receiving 10 pigs of tin and two barrels of scrap brass which had been stolen from an interstate shipment was set aside, and a new trial ordered. The reversal of the conviction was based on an erroneous instruction to the jury, placing the burden on the defendant of explaining his possession of the goods in question. Suit has been filed in the United States District Court here by the Stanley Manufacturing Company, of Dayton, Ohio, against the Globe Metal Label Company, of Cincinnati, Ohio, to restrain the defendant company and the partners comprising it from making use of information which it is alleged they acquired confidentially while acting as employees of the plaintiff company. Secret processes of making dies, metal labels and so forth are said to be involved.

The Thomas Buchanan Company, manufacturers of electro platers' supplies, has filed suit against Charles L. Buchanan, its former superintendent, and Thomas Whitehead, former salesman, to enjoin them from attempting to injury its business by inducing other employees to leave, which it is alleged they have tried to do. Damages to the amount of $5,000 were also asked. A temporary injunction was issued.

Samuel Weintraub, a metal dealer of Springfield, Ohio, was recently fined $500 and costs in a case in which he was accused of purchasing stolen metals from children. Several large concerns, which had suffered from petty thefts, assisted in the prosecution, charging that Weintraub had induced the children to steal and sell the metal to him.—K. C. C.

DETROIT, MICH.

JULY 10, 1916.

War clouds hanging over the States seem to have no material effect on business conditions in Detroit and other parts of Michigan, where large quantities of munitions are manufactured for the Allies. It is not believed even if the United States does go to war with Mexico that the munition factories will be in any way affected. So great are the facilities for manufacturing this product it is understood that the United States can produce enough for the needs of the Allies as well as itself.

It is reported that Henry Ford recently was asked by an army official how long it would take him to produce and deliver to the government 10,000 trucks. He is reported to have replied that if his company was given twenty-four hours' notice they could begin the delivery of 1,000 trucks a day.

The Packard Motor Car Company, which is working on heavy contracts for the Allies also is delivering large numbers of trucks to the United States. These heavy orders, together with the contracts for munitions now being handled by brass factories of this city are keeping every plant in this line busy. The demand for skilled mechanics still is unsettled and many factory managers are seeking help in outside cities.

In a recent interview, E. E. Allyne, president of the Aluminum Castings Company, declares that the year 1916 will mark the beginning of the aluminum age in the development of the world's industries. The greatest factors, he declares, in bringing about this condition are the automobile industry and the European war. The radical experiments of 1915 have tended to prove to a greater degree the latent possibilities that exist in this wonderful bluish-white metal.

The Motor Castings Company, with J. D. Curry as president and E. H. Briggs as vice-president, recently has engaged in the manufacture of motor car cylinder castings. The company has its shop in Hart avenue, with offices at 997 Woodward avenue. A. Lanigan, well-known in the foundry business and as a metallurgist, is in charge as manager. This company will also maintain a pattern department. The company is already reported to be rushed with orders from out of town as well as from this city.

Common stockholders of the Michigan Copper and Brass Company have received checks for a 25 per cent. dividend. The stock has been increased from $600,000 to $1,000,000.

The Tri-State Metal Company, with offices at 318 Penobscot building, is one of the newer concerns that now is engaged in business in this city. This company is acting both as brokers and as dealers in white, red and yellow metals.

The Detroit Foundrymen's Association has elected the following officers: President, Robert Carolin; vice-president, Herbert Osborne; secretary, E. W. Kessler; treasurer, E. I. Chase; executive committee, J. W. Collins, W. Bruce Howard, Edward Whitmore, W. A. Fletcher.

Detroit brass manufacturers estimate their daily loss by theft at $1,000 a day and are actively engaged in pushing the prosecutions in the hope of suppressing this evil.—F. J. H.

The one consoling feature during a storm is the coming calm that is sure to follow and in the same way the nonferrous metal manufacturers in Detroit, after several years of depression to a certain extent, is now at the limit of real prosperity. This desirable condition has also, however, some difficulties, so neither adversity on the one hand and prosperity on the other is free from perplexities. The principal obstacle to real enjoyment of existing conditions by the leading brass manufacturers is the delay in receiving raw materials and cost of same.

The American Tap-Bush Company, 1174 Jefferson avenue, are doing a nice business of sherardizing under a process of primarily dry galvanizing by which steel and iron articles are given a continuous coating of zinc. The process this company is following does not deposit a mere superficial outer coating the same as the hot dip or electrolytic methods of galvanizing do, but the zinc dust used in sherardizing penetrates into the pores and forms a dense homogenous alloy with the metal itself. This alloy then becomes covered with a coating of pure zinc. The evenness of the coating preserves the shape of stamped letters, the sharpness of threads and nuts.

The General Aluminum and Brass Manufacturing Company, Boulevard and Saint Aubin street, has increased its capital stock and is doing a good business.

Building operations throughout the country being above the average, it is creating quite a demand for plumbing, steam and electrical fixtures and all the factories manufacuring these lines are running to full capacity.

F. Manche, president Allyne Brass Works, reports business good and his plant working to the full limit. They manufacture a full line of plumbing brass goods.

The brass plants along the Canadian border cities have received some good orders from the Imperial Munitions Board that are keeping them busy. They report quite a scarcity of labor and the question of female help is under consideration by the management of some of the concerns.—P. W. B.

LOUISVILLE, KY.

JULY 10, 1916.

With the factories of the Ohio Valley running full time, and business generally rushing, the coppersmiths and other metal workers are finding business extremely good. At the present time the greatest difficulty is in obtaining competent metal workers, and as a result immediate delivery business is almost out of the question. Several of the copper working concerns report that they are unable to promise better than three to four months deliveries just now; one reason being that material cannot be secured in less time. Converting whisky distilleries into alcohol distilleries is the outstanding feature of the local trade, and nearly every concern handling distillery work has more of this business than it can handle just now.

That business is generally good is indicated by the fact that the report of the Louisville Clearing House shows weekly gains of three to four million dollars in clearings over the corresponding period of last year. Again business with the railroads has increased so rapidly that the Louisville & Nashville Railroad, the largest industry in the city, has restored its usual annual dividend of seven per cent, and the company's shops are now working full time in all departments.

Prices on copper are still high with deliveries practically as slow and uncertain as they were at this time last month. Base quotations are about as follows: tubes, 41@42c; sheet, 38@39c; ingot, 32@33c. Casting copper, made up of scrap, etc., can be bought at about 30c.

The manufacturing jewelers are experiencing the best summer business on record. According to W. G. Buschemeyer, one of the leading workers in precious metals, he has been working two to three nights a week since the middle of June, a record that is unprecedented. In addition to a lot of repair work a quantity of new work is demanded in platinum and gold. The high price of platinum is increasing the demand rather than lessening it. Mr. Buschemeyer stated that platinum was now worth about five times as much as pure gold, and ten times as much as 14 karat gold.

The Vendome Copper & Brass Works has completed two big jobs in Chicago on chemical plants for Swift and Morris, the well known meat packers. At present the concern is busy on several alcohol and other distillery contracts.

The Belknap Hardware & Manufacturing Company, one of the largest handlers of plumbing and other finished brass goods in the city, recently announced that any of its men who desired to join the militia would be granted a leave of absence with their jobs open for them on their return to the city. A number of other local concerns have made similar arrangements in order to raise the First Kentucky Regiment to its fighting strength.

The Louisville Fire Brick Works, manufacturers of firebrick for rolling mills, steel mills, foundries, etc., was recently awarded a big Government contract to supply all firebrick to be used in the navy yards, and on Government vessels for a period of about one year. The contract is for about 200 cars of brick.—G. D. C.

TRENTON, N. J.

JULY 10, 1916.

Men employed in plants where munitions of war are being made for European nations are beginning to wonder how long their positions will last because of the fact that the du Ponts have laid off hundreds of hands during the past few weeks.

Several Trenton plants are busy turning out war material of various kinds. The plant working on the largest war order in this section is the Jordan L. Mott company in South Trenton, where time fuses are being made. This order is said to represent $5,000,000, and it is now reported in labor circles that this big order is nearly completed. It is also reported that the Mott company has a second similar order and that work on this will begin at the completion of the first. Officials of the Mott company will not discuss the matter, but report comes from employees at the big works.

The Mott company, previous to receiving the big order, went to considerable expense in having specially-made machinery constructed to turn out the time fuses, and it is probable that company will later turn its attention to making war munitions for the United States Government. Other than making munitions the plant is not very busy. There has been some dissatisfaction at the works because of alleged favoritism in giving munition jobs to certain employees. Some employees—who are foreigners—are making very high wages, while other employees are working at the same old rate in effect before the big order arrived.

Trenton plants manufacturing metal goods continue to keep busy during the warm weather. Some of them have enough orders on hand to keep them busy for some time. The Skillman Hardware Manufacturing Company is very busy. The Trenton Brass and Machine Company is working on various kinds of orders, and is in the market to manufacture anything in the brass line. The company is now turning out metal trimmings for the Mercer Automobile Company. The latter company is behind in its orders and this gives plenty of work for the Trenton Brass and Machine Company.

The Billingham Brass and Machine Company, the Electric Plating Works, the Bechtel Engraving Company, the Ingersoll-Trenton Watch Company, the Clifford Novelty Company and the McFarland Foundry and Machine Company, all report business pretty good at the present time.

Declaring that girls are more efficient on the fine work required in the manufacture of time fuses, the Standard Fuse Corporation at Bordentown has discharged a number of male employees and filled their places with female help. More than 500 hands are now employed at the plant, working in two shifts, from 7 to 3 and from 7 to 1 at night. The girl employees earn good wages and recently a nurse left a Trenton hospital after serving two years at the profession to work on munitions. She earns as high as $20 a week. About 150 of the male fuse workers have been organized into a union at Trenton by the Mercer County Central Labor Union. They then presented demands for an increase in wages and got what they asked for the following day

It is rumored that another munition plant will be started at the old Higgins mill near here and that new machinery will be installed in a short time.

The Florence Iron Works, including the hydrant foundry and brass foundry, was sold at receiver's sale June 28, 1916, to Walter Wood, of Philadelphia, Pa., a principal stockholder in the concern. The plant was sold for $528,500, including 209 of the company's dwelling houses. The plant employs 900 men. The sale was conducted by an order of the United States District Court, and the receiver was Senator Harold B. Wells, Bordentown, N. J. The plant has a capacity of 8,000 hydrants, 3,000 valves per year, and 60,000 gross tons of pipe.—C. A. L.

NEWARK, N. J.

JULY 10, 1916.

Business continues to be good in and around Newark, and most of the factories are very busy, some even working overtime. There is, however, little indication of a greater conservatism than was manifested a month or six weeks ago. This doubtless is in part due to the uncertainties of the international situation, but probably in part at least to the fact that the summertime is at hand when some lines, at least, are usually a little slack. The conservatism, however, has not meant any decided lull or slump. Much more business is being done by practically every concern than a year ago, and many are doing more than they have done at this season for several years. It goes without saying that munition plants keep very busy, many of them working on two or three shifts. Conditions described above relate to what might be called legitimate trade. Just now there is a strike of the machinists, which has tied up many plants. There are several thousand strikers now out, and while some of the manufacturers have agreed to give them the shorter hours with the same pay which they have been receiving, which is what the strikers demand, many other manufacturers refuse to grant the demands or even treat with the men. There is such a demand for machinists everywhere that many who struck here have secured positions elsewhere. As is customary on the 1st of July, many of the jewelry and metal working factories closed for periods of from a few days to two weeks or more for their semi-annual overhauling of machinery and engines and for repairs, alterations, etc. Practically no platinum is coming in now except from South America, and the quantity of that is small. Scrap is eagerly sought after. Silver is not as high as it was, but it is gradually going up again. Jewelry manufacturers did a fine business as a rule during the first six months of the year, and all look forward to a fine business this fall, unless there is a greater upheaval in business than now appears probable. Hundreds of men from the various factories dealing in various kinds of metal goods have gone to the front in response to the call for troops issued by President Wilson. This has still further complicated the labor market here. There has been a constantly growing complaint that it is difficult to get enough competent help. Now that such a large number have been withdrawn from industry the need is more imperative than ever.

The Clinton Metal Novelty Company is the trade name which has been filed for the metal novelty manufacturing business at 16 Washington avenue, Irvington, N. J., by Rose Echelhofer, of 1165 Clinton avenue, Irvington.

For the second time Jacob Fischel has been appointed receiver for the Dirigold and Metals Company, 43 Oliver street. An attempt was made to have the concern declared bankrupt last December, and the opinion of the referee in bankruptcy favored the petitioners. His finding was overruled by the Court, however, in the early part of May. Another action has now been started by one of the former petitioners, A. D. Jackson, formerly superintendent in the company's plant, who has a wage claim for $351, and who claims that the company is still unable to pay its bills. The aggregate of the claims against the company is said to be over $10,000, of which the sum of $8,000 is due officers for salaries and money loaned. This company was the manufacturer of the alloy "cupror."—R. B. M.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The United States Metals Refining Company, Chrome, N. J., will enlarge its plant. Estimated cost, $500,000.

A new one-story brick addition, 50 x 107 feet, is being constructed by the American Nickeloid Company, Peru, Ill.

A two-story addition, 64 x 110 feet, is being built to the plant of the Maxim Silencer Company, manufacturer of guns, Hartford, Conn.

The Bremer-Waltz Corporation, dealer in aluminum ingots, sheets, wire and powder, is now located in its new offices in Rooms 328 and 330 30 Church street, New York.

The Crane Company, Chicago, Ill., has taken out building permits covering the erection of additional buildings at its Corwith works, which are estimated to cost $1,500,000.

The Spicer Manufacturing Company, foundry and machine works, New Philadelphia, Ohio, is planning to rebuild its plant which was recently destroyed by fire. R. T. Horning is manager.

The five-story, 70 x 352 feet, addition which is being constructed to the plant of the Scovill Manufacturing Company, manufacturer of brass goods, Waterbury, Conn., is now nearly completed.

The J. M. Ney Company, smelter of gold, silver and platinum, and manufacturer of silver solders, Hartford, Conn., is erecting a new office and factory building.

McKesson & Robbins, New York, N. Y., has filed plans for a six-story brick factory and warehouse 100 x 100 feet, to cost about $100,000, at the corner of Berry and North Eleventh streets, Williamsburg, N. Y.

The contract has been awarded for the construction of a factory for George W. Prentiss & Company, manufacturers of wire, Holyoke, Mass. A rolling mill and tinning department are operated by the Prentiss company.

The Niagara Alkali Company, Niagara Falls, N. Y., has started the construction of several new buildings, which will increase its present capacity by about sixty per cent. It is expected that the new addition will be ready for operation by December 31, 1916.

The Abbott Ball Company, manufacturers of steel balls and barrels for polishing, burnishing and buffing by the Abbott process, have let the contract and work has been started on two additional buildings at their plant in the Elmwood district, Hartford, Conn.

The Beaton & Corbin Manufacturing Company, Southington, Conn., has purchased the floor and ceiling plate business of the Peck, Stow & Wilcox Company, Southington. The company also operates a plating and polishing department and tool and grinding room.

The Doehler Die Casting Company, Brooklyn, N. Y., has awarded a contract for the erection of a four-story reinforced concrete factory building, approximately 125 x 50 feet, with an L, 25 x 54 feet, and which will be located on Court and Huntington streets.

The Maxwell Motor Company, Detroit, Mich., reports that the published statement regarding the construction of an additional factory to its plant at Detroit is incorrect, but that additions will be made to its plant at Newcastle, Ind., at an estimated cost of $250,000.

The La Porte Foundry & Furnace Company, La Porte, Ind., has been organized with a capital of $50,000. The directors are George W. Gilderman, W. N. Rumely, A. J. Rumely, C. E. Wolfe and A. J. Hickey. They will operate a brass, bronze and aluminum foundry and casting shop.

Coates, Bennett & Reidenbach, Inc., Rochester, New York, state that they expect to remodel their smelting plant, and will be in the market shortly for improved devices for melting, and would be glad to have manufacturers of furnaces for the reduction of copper and copper bearing materials communicate with them.

The Baudet Manufacturing Company, 518 Ninety-second street, Brooklyn, New York, are fitting up a plant for manufacturing oxy-acetylene welding outfits. They claim great efficiency for their new apparatus and state that it will be sold at a lower price than any other reliable outfit on the market.

The Niagara Metal Works, Inc., Buffalo, N. Y., has taken over the plant of the Farr Manufacturing Company on Schenck street, North Tonawanda, N. Y., which it will remodel and equip as a brass foundry. Apparatus for a metal refining plant will also be installed. Ralph R. Parish is president and Alfred Weeks, secretary.

The Joseph N. Smith & Company, manufacturers of automobile hardware, Detroit, Mich., is constructing a two-story factory at Dubois street and East Grand Boulevard. Brass, bronze and aluminum foundry, brass machine shop, grinding room, tool room, stamping, plating, polishing, japanning and lacquering departments are operated by this company.

The Bay City Foundry & Machine Company, Bay City, Mich., has been organized to take over the plant and business of the M. Garland Foundry & Machine Company. The officers of the new company are as follows: John C. Ross, president; L. G. Howlett, vice-president and manager; W. W. Chapman, secretary, and Norris R. Wentworth, treasurer.

J. P. Golden, vice-president and general manager of the Goldens' Foundry and Machine Company, manufacturer of power transmission machinery, Columbus, Ohio, states that at present the company will not make any additions to its plant on account of being extremely busy, but that in the near future expect to extend the machine shop 110 x 250 feet and also the foundry 100 x 225 feet.

The Shankin Manufacturing Company, manufacturers of brass, Springfield, Ill., expects to be in its new factory, which it is building at Eleventh street and Stanford avenue, by July 5, 1916. The estimated cost of the new building is $10,000. The departments operated by this company are brass machine shop, tool room, grinding room, stamping, soldering, polishing, plating and lacquering.

The Johnson Bronze Company, New Castle, Pa., which recently took over the works of the American Car & Ship Hardware Company, is planning large additions. New steel buildings will be erected to replace wooden structures at a cost of about $85,000. The company operates a brass, bronze and aluminum foundry, brass machine shop, tool and grinding room and plating, polishing and lacquering departments.

The Detroit Heating and Lighting Company, manufacturers of sheet metal specialties and platers and polishers, is erecting a modern building, 70 x 80 feet, two stories high, fitted with overhead traveling crane for conveying the heavy copper and sheet iron work and automobile specialties. Plating, polishing, brazing, soldering and japanning departments and a tool and grinding room are conducted by this company.

The F. H. Lawson Company, manufacturers of sheet metal goods and dealers in tin plate and metals, Cincinnati, Ohio, is erecting a new factory in addition to the one already occupied. The estimated cost of the new factory is from $200,000 to $225,000 and will be completed within seven or eight months. The departments operated by the company are tool room, spinning, galvanizing, stamping, japanning and lacquering.

George S. Youngs, Bridgeport, Conn., who has been doing a large business in the manufacture of brass ingots, etc., has taken possession of the plant formerly occupied by the Ellsworth Brass Foundry on Railroad avenue, and is having it put in shape to melt aluminum in large quantities. Mr. Youngs recently secured a very large order for aluminum ingots for export. At his old brass plant on Stella street, near Housatonic avenue, they are working twenty-four hours a day turning out brass billets.

The Morton B. Smith Company, 241-243 Front street, New York, for many years prominent in the trade in old metals and scrap iron and steel, announces that it has decided to discontinue its iron and steel department. Attention will hereafter be given exclusively to old metals, and the scope of the business in this direction will be enlarged. After existing contracts involving scrap iron and steel have been liquidated, a new company will be formed to handle such material under the control of William Vander Koogh, who has been in charge of this department.

Ohio Bronze Powder Company, manufacturers and importers of gold, bronze and aluminum powders, Cleveland, Ohio, is erecting a building on East 152d street to be used for the manufacture of all grades of bronze powder. The new building will contain 59,000 square feet of floor space and a separate building will be erected for an office building and both will be ready for occupancy about September 1, 1916. The management of the new plant will be in charge of Dr. G. F. Glass, president, and E. Koch, secretary and treasurer.

As announced a short time ago, the Hachmeister-Lind Chemical Company, Pittsburgh, Pa., manufacturers of chemicals and plating supplies, are putting up a new factory and warehouse on Forbes street, a few blocks from their present location. The structure will be seven stories high, with a frontage of 96 feet on Forbes street, and 120 feet deep. A private railroad siding runs into the property, giving excellent shipping facilities. The company states that they are compelled to put up this new building on account of the remarkable increase in business in their plating supply department. In the new quarters they will go into the manufacture of chemicals for the plating trade in a very heavy way, making a complete line of sulphates and carbonates, and also of buffing and polishing necessities. Greatly enlarged equipment for the manufacture of their two leading plating specialties, Sustanol and Chimisol, will also be installed.

Among the metal companies who have announced that they will continue their employees who enlist for military duty in the Mexican difficulties on the pay roll and will also look after dependent families the following are notable: The U. T. Hungerford Brass and Copper Company, of New York, in addition to paying full salaries for the period of military service and holding promotion rights open, have taken out a group insurance policy on the lives of all of its employees, including those who have gone with the militia and without requiring the medical examination of any. It insures the life of every employee for the sum of his or her yearly salary and the company pays all the cost.

The American Brass Company, Waterbury, Conn., has advised its men who are members of the state militia and are called to the colors that their places will be kept open for them, and that while they are in the service of the state their pay will continue and their families will be looked after. Should they be called out of the state for service in Mexico or on the border, some arrangement will then be made which will insure care for their dependents.

Other companies who have adopted the same policy are the American Metal Company, New York, N. Y.; Bethlehem Steel Company, Bethlehem, Pa.; Driggs-Seabury Ordnance Company, Bridgeport, Conn.; Harrolds Motor Company, Nathan and Tucker and the Savage Arms Company. These concerns will probably be followed by a large number of others.

BUSINESS TROUBLES

General Wilbur F. Sadler, adjutant general of the state of New Jersey, has been named receiver of all the property of the American and British Manufacturing Company situated at Providence, R. I., and Bridgeport, Conn. The concern is said to have assets of $10,000,000 and has been engaged for about two years on munition contracts for the Allies. General Sadler is also receiver of the International Power Company, which has among its chief assets a controlling interest in the stock of the American and British firm. General Sadler is subject to the direction of the New Jersey Court of Chancery.

REMOVALS

The Olemite Metal Company, Chicago, Ill., has moved its plant to 341-351 West Chicago avenue, where it will install modern machinery throughout. The company operates smelting, refining, brass machine shop, tool room and casting shop.

The Walker M. Levett Company, pioneer manufacturer of the original aluminum alloy piston known as Magnalite piston, 464 Tenth avenue, New York, N. Y., has moved to its new plant at 417-421 East 23d street and 422-424 East 24th street, where it has greatly enlarged facilities for turning out its products which consist of aluminum, brass and bronze castings.

INCREASE IN CAPITAL STOCK

The Standard Brass & Copper Tube Company, manufacturers of tubes, New London, Conn., has increased its capital stock from $50,000 to $150,000. The increase of $100,000 is 1,000 shares of common stock at a par value of $100.

The North & Judd Manufacturing Company, New Britain, Conn., has increased its capital stock from $1,000,000 to $1,500,000, $250,000 of which will be issued at once and the remainder retained in the treasury. The company is having plans drawn for a power house.

The Bristol Brass Company, Bristol, Conn., has increased its capital stock from $800,000 to $1,000,000. Two buildings in addition to those under construction will be erected, one 120 x 200 feet and the other an extension, 60 x 200 feet. The company is very busy and has a large number of orders booked.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To manufacture die cast bearings.—The Alloy Die Casting Company, Detroit, Mich. Capital, $25,000. Incorporators: Ralph Johnson, Henry Hensler and Frederick R. Minckler.

To manufacture valves and plumbers' supplies.—The Foley Valve and Faucet Company, New York, N. Y. Capital, $50,000. Incorporators: Richard T. Foley, Ridgefield Park, N. J.; Timothy J. Foley and Frederick Hughes.

To manufacture copper and metal products.—The Anthony Manufacturing Company, New York, N. Y. Capital, $250,000. Incorporators: J. Eugene Rogers, New York, N. Y.; Stewart Wells, Madison, N. J., and William P. Brew, Ocean City, N. J.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Heat-Treating Furnaces.—The Metals Production Equipment Company, New York, N. Y., have issued bulletin No. 6 containing complete descriptions and illustrations of their over-fired accurate temperature heat-treating furnaces being manufactured and installed by them.

Fuel Oil Appliances.—The W. S. Rockwell Company have just issued bulletin No. 31 treating of fuel oil appliances. The well known Rockwell oil and gas burners are very effectively illustrated and thoroughly described in this bulletin. Other things mentioned are fuel oil pumps, blowers, pressure tanks, oil valves, pressure gauges and steam separators and blowers. The Rockwell company solicits inquiries for better heating methods and equipment irrespective of purpose or fuel.

Cleaning Compounds.—The Electro Platers Supply Company, 1302 Ontario street, Cleveland, Ohio, a new concern, have issued advertising matter consisting of blotters and folders in the interest of their Royal Cleanser cleaning compound used with electricity and the Royal Alkali Special which is used without it and also Leoxide which is placed

upon the market to take the place of potassium sulphide for producing black or oxidized finishes on metals.

Monel Metal Tubing.—The Supplee-Biddle Hardware Company, Monel metal department, Philadelphia, Pa., announce that they have entered into the manufacture of Monel metal tubing and that their plant is equipped to make the sizes and gauges which are shown on a form which they have just issued. It is the intention of the company to carry a stock of Monel metal tubing in most of the standard sizes from ½ inch up to 2 inches in diameter. The company also issued at the same time a hanger which gives a useful table of weights of Monel metal sheets and it may be had upon request.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

NEW YORK, July 10, 1916.

COPPER

The month of June shows a steady and persistent decline in all metals, including pig iron and steel.

The price of Electrolytic copper has declined about 2 cents per pound during the month for prompt shipment copper, from 28¾ at the opening to 26¾ at the close, while prices for the last quarter of the year have declined from 27 cents to sellers at the end of the year 24 cents. The large producers who seem to be pretty well sold up for July and August have been holding steadily to 29 cents for last quarter, and it is only natural to suppose that their stocks of copper are being rapidly replenished. The large producers claim that some consumers will have to buy a lot of copper for the last four months of the year, and that the business will have to be done with the large producers, and they feel perfectly safe in "holding the umbrella." Meanwhile every consumer in the country has been deluged with offers of copper from 28½ for prompt to 24 cents for last quarter, and it hardly seems likely that consumers have not covered for all the copper they need for the balance of the year. There have been some fair-sized export orders placed during the month, possibly 10,000 tons, in lots of 500 to 700 tons, and all this copper has come from the smaller dealers and producers, at the same time consumers have been able to get all the copper they need at a price of 2 cents per pound below the price the large producers are holding for.

Lake copper has been very dull and is quoted at from 26½ cents to 26 cents for the arsenical brands. Casting copper is offered at 23¾ for prompt to 22½ for future deliveries.

The exports for the month are good and are beginning to show some of the export business that was placed some time back. Total exports for June, 38,373 tons, making total for first 6 months of 1916, 146,721 tons, against 136,527 tons during the same period in 1915.

TIN

Tin prices declined about 6 cents per pound during the month of June, from 45.50 at the opening (the high point for the month) to 39.62½ at the close. Trading has been fairly active, and at the decline consumers have been buyers. The consumption for the month has been large, according to the Metal Exchange, 6,398 tons against 5,455 tons in May and 3,900 tons in June last year.

LEAD

The Trust held the price of lead at 7 cents during the month, although independents were sellers at ⅛ to ¼ cent lower, and the market was dull and easier.

On July 5 the Trust dropped the price $10.00 per ton to 6.50 New York basis; the outside market is about ¼ cent lower.

SPELTER

The price of spelter is about 2 cents lower than at the opening and the market has a weak appearance. Opening at 13¼, New York, for Prime Western brands prices declined to 11⅛ at the end of the month. During the first few days of July prices declined another cent and a half to close to 9½ cents, New York delivery.

ANTIMONY

Prices declined about 7½ for antimony during June, from 24½ to 17 cents at the close for Chinese-Japanese. The market has been very dull and consumers are holding off.

ALUMINUM

The aluminum market was pretty well cornered during the month, and from 60 cents for the 98-99 Virgin Aluminum prices were run up to 64 and 65 cents asked. Some good export orders were caught at the advance, but prices soon sagged again and to-day there are sellers at 61 cents for any delivery.

SILVER

Silver prices declined about 3 cents per ounce during the month and closed at 65 cents, New York.

QUICKSILVER

The decline in the price of quicksilver was stopped at around $78.00 per flask. Some sales were made at lower figures, but the regular market quotation was not lower than $68. From that time prices reacted again on a good demand, and holders today are asking $80 per flask.

PLATINUM

Platinum prices declined about $5.00 per ounce, from $80 the nominal quotation to $75 per ounce at the close.

SHEET METALS

The prices of sheet copper, copper wire and brass are entirely nominal. The price of copper has gone off nearly 5 cents per pound since the present quotations were established, and they are still unchanged. Copper wire usually sells at 1¼ cents above the price of Electrolytic. Electrolytic is selling to-day at from 26 for prompt to 24 for futures, and copper wire is quoted at around 29 cents. Sheet copper is about on the same basis, 37½ base, high sheet brass 38 cents. These prices are all out of line with the copper market and are entirely nominal.

OLD METALS

The old metal market has been dull and weak in accordance with the decline in the ingot metals. All prices are lower and consumers are not buying except for immediate needs.

J. J. A.

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

Lake Copper. 1915—Average for year, 18.94. 1916—January, 24.75. February, 27.75. March, 28. April, 29. May, 29⅞. June, 28.25.

Brass Mill Spelter. 1915—Average for year, 17.50. 1916—January, 22.25. February, 22.75. March, 23.15. April, 23.20. May, 21.20. June, 17.40.

JUNE MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Closing.
Lake	28.50	26.50	27.00
Electrolytic	28.90	26.40	26.75
Casting	76.50	24.00	24.00
TIN	45.50	39.00	39.70
LEAD	7.50	6.75	6.90
SPELTER	14.00	11.00	11.20
ANTIMONY (Chinese and Jap.)	25.00	16.50	17.00
SILVER	68¾	62¾	65.44

DAILY METAL PRICES

By an arrangement with the daily metal papers, The Metal Industry can furnish daily metal prices, and we offer a special combination subscription price of $10 per year for this service. The price of the daily paper alone is $10 and of The Metal Industry alone $1.00—combination offer $10.

Metal Prices, July 10, 1916

NEW METALS.	Price per lb. Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	27.00
Electrolytic, carload lots	26.00
Casting, carload lots	24.00
TIN—Duty Free.	
Straits of Malacca, carload lots	39.25
LEAD—Duty Pig (Bars and Old 25%; pipe and sheets 20%. Pig lead, carload lots	6.40
SPELTER—Duty 15%.	
Brass Special	11.50
Prime Western, carload lots, nominal	9.50
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½. per lb.	
Small lots, f. o. b. factory	68.00
100-lb. lots, f. o. b. factory	64.00
Ton lots, f. o. b. factory	61.00
ANTIMONY—Duty 10%.	
Cookson's cask lots, nominal	.....
Hallett's cask lots, nominal	.....
American	16.00
Chinese, Japanese	16.00
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot, Placquettes, Ingots, Blocks	45.00
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	6.00
BISMUTH—Duty free	5.00
CADMIUM—Duty free	nominal 1.90
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	2.00
QUICKSILVER—Duty, 10% per flask of 75 pounds	80.00
GOLD—Duty free	$20.67
PLATINUM—Duty free	$74.00 to 78.00
SILVER—Government assay—Duty free	.63⅜

INGOT METALS.	Price per lb. Cents.
Silicon Copper, 10% ... according to quantity	37 to 40
Silicon Copper, 20% ... " "	38 to 41
Silicon Copper, 30% guaranteed " "	39 to 42
Phosphor Copper, guranteed 15% " "	35 to 40
Phosphor Copper, guaranteed 10% " "	34 to 39
Manganese Copper, 30%, 2% Iron " "	48 to 53
Phosphor Tin, guaranteed 5% " "	55 to 60
Phosphor Tin, no guarantee " "	45 to 47
Brass Ingot, Yellow " "	16 to 18
Brass Ingot, Red " "	20 to 22
Bronze Ingot " "	20 to 22
Parsons' Manganese Bronze Ingots " "	31 to 32½
Manganese Bronze " "	30 to 31
Phosphor Bronze " "	24 to 26
Casting Aluminum Alloys " "	50 to 51

PHOSPHORUS—Duty free. According to quantity	35 to 40

Dealers' Buying Prices. Cents per lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
22.00 to 23.00	Heavy Cut Copper	25.00 to 26.00
21.00 to 22.00	Copper Wire	24.00 to 25.00
18.00 to 19.00	Light Copper	21.00 to 22.00
17.00 to 17.50	Heavy Mach. Comp.	18.50 to 19.00
13.50 to 14.00	Heavy Brass	16.00 to 16.50
11.00 to 12.00	Light Brass	13.00 to 13.50
14.00 to 15.00	No. 1 Yellow Brass Turnings	15.50 to 16.00
14.00 to 15.00	No. 1 Comp. Turnings	16.00 to 17.00
6.50 to	Heavy Lead	.... to 7.00
12.00 to 13.00	Zinc Scrap	14.00 to 15.00
18.00 to 23.00	Scrap Aluminum Turnings	20.00 to 25.00
30.00 to 35.00	Scrap Aluminum, cast alloyed	35.00 to 40.00
35.00 to 40.00	Scrap Aluminum, sheet (new)	45.00 to 50.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 24.00	Old Nickel	20.00 to 24.00
20.00 to 24.00	Old Nickel anodes	20.00 to 25.00

PRICES OF SHEET COPPER.

Mill shipments (hot-rolled), ... 37½c. base net.
From stock. ..... 39c. base net.

SIZE OF SHEETS. Width.	LENGTH.	Extras in Cents per Pound for Sizes and Weights Other than Base. 64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Not longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 8c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC—Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill ... 18.00 cent basis, less 8%
Casks, jobbers' prices 18½
Open casks, jobbers' prices 19

Metal Prices, July 10, 1916

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect May 10, 1916.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.40	$0.41	$0.42
Wire	.40	.41	.42
Rod	.40	.42	.43
Brazed tubing	.45	—	.47
Open seam tubing	.45	—	.47
Angles and channels	.45	—	.47

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.42	$0.43	$0.44
Wire	.42	.43	.44
Rod	.42	.44	.45
Brazed tubing	.47	—	.49
Open seam tubing	.47	—	.49
Angles and channels	.47	—	.49

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

32½c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	40c.	per lb. base
100 lbs. to 300 lbs. in one order	40½c.	" " "
Less than 100 lbs. in one order	42c.	" " "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, — per lb.
Seamless Copper Tubing, — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛ ¼ ⅜ ½ ¾ 1 1¼ 1½ 2 2½ 3 3½ 4 4½ 5 6

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch		
½ inch		
⅝ inch		
¾ inch		
1 inch		
1⅛ inch		
1¼ inch		
1½ inch		
1¾ inch		
2 inch		

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	42c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	40c.	" "
Muntz or Yellow Metal Rectangular sheets other than Sheathing	43c.	" "
Muntz or Yellow Metal Rod	41½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 58c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 7c. over Pig Tin. 50 to 100 lbs. 8c. over, 25 to 50 lbs. 15c. over, less than 25 lbs. 3c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Base price, 60c.

Gauge.	Width. Inches.	Less than 1 ton.	50 to 2,000 lbs.	Less than 50 lbs.
20 and heavier	3-30			
	30-36			
21 to 24 inclusive	30-48			
	48-60			
25 to 26	3-30			
	30-48			
27	3-30			
	30-48			
28	3-30			
	30-48			
29	3-30			
	30-48			
30	3-30			

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.	2½ in.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.																	
12.	.109.																	
14.	.083.																	
16.	.065.																	
18.	.049.																	
20.	.035.																	
21.	.032.																	
22.	.028.																	
24.	.022.																	

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

We are unable to quote these prices.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	44c.	16%	48c.
8%	45½c.	18%	48½c.
10%	46c.	20%	51c.
12%	47c.	25%	60c.
15%	47½c.	30%	66c.

GERMAN SILVER WIRE.

Quality	Net per lb.	Quality.	Net per lb.
5%	47c.	15%	53¾c.
8%	49c.	16%	54¼c.
10%	50½c.	18%	56¼c.
12%	52¼c.	30%	71½c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.